RAJALAKSHMI ENGINEERING COLLEGE

[AUTONOMOUS]

RAJALAKSHMI NAGAR, THANDALAM – 602 105

RAJALAKSHMI
ENGINEERING COLLEGE

CS23333 OBJECT ORIENTED PROGRAMING USING JAVA

Laboratory Record Note Book

Name : . Shiyam ……..

Year / Branch / Section : . . II/IT/D. .. . .

College Roll No. : . . . . . 2116231001193. . . . . .

Semester : . . . . . III. . . . . .

Academic Year : . . . . . 2024-2025 . . . . . .

RAJALAKSHMI ENGINEERING COLLEGE

[AUTONOMOUS]

RAJALAKSHMI NAGAR, THANDALAM – 602 105

BONAFIDE CERTIFICATE

Name : . .Shiyam.. . . . . .

Academic Year : 2024-2025 Semester:. III Branch : IT-D

Register No. 2116231001193

Certified that this is the bonafide record of work done by the above student in the CS23333 –Object Oriented Programming using JAVA during the year 2024 - 2025.

Signature of Faculty in-charge

Submitted for the Practical Examination held on . . . . . .

Internal Examiner **External Examiner**

LAB - 01

JAVA ARCHITECTURE , LANGUAGE BASICS

Question **1**

Write a program to find whether the given input number is Odd.

If the given number is odd, the program should return 2 else It should return 1.

Note: The number passed to the program can either be negative. positive or zero. Zero should NOT be treated as Odd.

For example:

Input	Result
123	2
456	1

CODING

```
import java.util.Scanner;
public class main{
   public static void main(String[] args){
      Scanner sc=new Scanner(System.in);
      int a=sc.nextInt();
      if(a%2==0){
         System.out.println("1");
      }
      else{
         System.out.println("2");
      }
   }
}
```

Input	Expected	Got	
123	2	2	✓
456	1	1	✓

Passed all tests!

Question **2**

Write a program that returns the last digit of the given number. Last digit is being referred to the least significant digit i.e. the digit in the ones (units) place in the given number.

The last digit should be returned as a positive number.

For example,

if the given number is 197, the last digit is 7

if the given number is -197, the last digit is 7

For example:

Input	Result
197	7
-197	7

CODING

```
import java.util.Scanner;
public class main{
    public static void main(String[] main){
        Scanner sc=new Scanner(System.in);
        int a=sc.nextInt();
        int b=Math.abs(a);
        System.out.println(b%10);
    }
}
```

Input	Expected	Got	
197	7	7	✓
-197	7	7	✓

Passed all tests!

Question **3**

Rohit wants to add the last digits of two given numbers.

For example,

If the given numbers are 267 and 154, the output should be 11.

Below is the explanation:

Last digit of the 267 is 7

Last digit of the 154 is 4

Sum of 7 and 4 = 11

Write a program to help Rohit achieve this for any given two numbers.

Note: Tile sign of the input numbers should be ignored.

i.e.

if the input numbers are 267 and 154, the sum of last two digits should be 11

if the input numbers are 267 and -154, the slim of last two digits should be 11

if the input numbers are -267 and 154, the sum of last two digits should be 11

if the input numbers are -267 and -154, the sum of last two digits should be 11

For example:

Input	Result
267 154	11
267 -154	11
-267 154	11
-267 -154	11

CODING

```
import java.util.Scanner;
public class main{
public static void main(String[] args){
    Scanner sc=new Scanner (System.in);
    int a=Math.abs(sc.nextInt());
    int b=Math.abs(sc.nextInt());
    int c=(a%10)+(b%10);
    System.out.println(c);
    }
}
```

Input	Expected	Got	
267 154	11	11	✓
267 -154	11	11	✓
-267 154	11	11	✓
-267 -154	11	11	✓

Passed all tests!

LAB-02

FLOW CONTROL STATEMENTS

Question 1

Consider a sequence of the form 0, 1, 1, 2, 4, 7, 13, 24, 44, 81, 149…

Write a method program which takes as parameter an integer n and prints the nth term of the above sequence. The nth term will fit in an integer value.

For example:

Input	Result
5	4
8	24
11	149

CODING

```
Import java.util.Scanner;
public class Sequence {
    public static void main(String[] args) {
        Scanner sc=new Scanner(System.in);
        int n=sc.nextInt();
        System.out.println(findNthTerm(n));
    }
    public static int findNthTerm(int n) {
        if (n == 1) return 0;
        if (n == 2 || n == 3) return 1;
        int[] sequence = new int[n];
        sequence[0] = 0;
        sequence[1] = 1;
        sequence[2] = 1;
        for (int i = 3; i < n; i++) {
            sequence[i] = sequence[i - 1] + sequence[i - 2] + sequence[i - 3];
        }
        return sequence[n - 1];
    }
}
```

Input	Expected	Got	
5	4	4	✓
8	24	24	✓
11	149	149	✓

Passed all tests!

Question **2**

You and your friend are movie fans and want to predict if the movie is going to be a hit!

The movie's success formula depends on 2 parameters:

the acting power of the actor (range 0 to 10)

the critic's rating of the movie (range 0 to 10)

The movie is a hit if the acting power is excellent (more than 8) or the rating is excellent (more than 8). This holds true except if either the acting power is poor (less than 2) or rating is poor (less than 2), then the movie is a flop. Otherwise the movie is average.

Write a program that takes 2 integers:

the first integer is the acting power

second integer is the critic's rating.

You have to print Yes if the movie is a hit, Maybe if the movie is average and No if the movie is flop.

For example:

Input	Result
9 5	Yes
1 9	No
6 4	Maybe

CODING

```
import java.util.*;

class prog{

   public static void main(String args[]){

      Scanner scan = new Scanner(System.in);

      int a = scan.nextInt();
```

```
        int b = scan.nextInt();
        if(a<2||b<2){
            System.out.println("No");
        }
        else if(a>8||b>8){
            System.out.println("Yes");
        }
        else{
            System.out.println("Maybe");
        }
    }
}
```

Input	Expected	Got	
9 5	Yes	Yes	✓
1 9	No	No	✓
6 4	Maybe	Maybe	✓

Passed all tests!

Question **3**

You have recently seen a motivational sports movie and want to start exercising regularly. Your coach tells you that it is important to get up early in the morning to exercise. She sets up a schedule for you:

On weekdays (Monday - Friday), you have to get up at 5:00. On weekends (Saturday & Sunday), you can wake up at 6:00. However, if you are on vacation, then you can get up at 7:00 on weekdays and 9:00 on weekends.

Write a program to print the time you should get up.

Input Format

Input containing an integer and a boolean value.

The integer tells you the day it is (1-Sunday, 2-Monday, 3-Tuesday, 4-Wednesday, 5-Thursday, 6-Friday, 7-Saturday). The boolean is true if you are on vacation and false if you're not on vacation.

You have to print the time you should get up.

For example:

Input	Result
1 false	6:00
5 false	5:00
1 true	9:00

CODING

```
import java.util.*;
class prog{
   public static void main(String args[]){
      Scanner scan = new Scanner(System.in);
      int a = scan.nextInt();
      boolean b = scan.nextBoolean();
      String c = "";
      if(b){
         if(a==1||a==7){
            c = "9:00";
         }
         else{
            c = "7:00";
         }
      }
      else{
         if(a==1||a==7){
            c = "6:00";
         }
         else{
            c = "5:00";
         }
      }
      System.out.println(c);
   }
}
```

Input	Expected	Got	
1 false	6:00	6:00	✓
5 false	5:00	5:00	✓
1 true	9:00	9:00	✓

Passed all tests!

LAB-03

ARRAYS

Question **1**

Given an array of numbers, you are expected to return the sum of the longest sequence of POSITIVE numbers in the array.

If there are NO positive numbers in the array, you are expected to return -1.

In this question's scope, the number 0 should be considered as positive.

Note: If there are more than one group of elements in the array having the longest sequence of POSITIVE numbers, you are expected to return the total sum of all those POSITIVE numbers (see example 3 below).

input1 represents the number of elements in the array.

input2 represents the array of integers.

Example 1:

input1 = 16

input2 = {-12, -16, 12, 18, 18, 14, -4, -12, -13, 32, 34, -5, 66, 78, 78, -79}

Expected output = 62

Explanation:

The input array contains four sequences of POSITIVE numbers, i.e. "12, 18, 18, 14", "12", "32, 34", and "66, 78, 78". The first sequence "12, 18, 18, 14" is the longest of the four as it contains 4 elements. Therefore, the expected output = sum of the longest sequence of POSITIVE numbers = 12 + 18 + 18 + 14 = 63.

For example:

Input	**Result**
16 -12 -16 12 18 18 14 -4 -12 -13 32 34 -5 66 78 78 -79	62
11 -22 -24 -16 -1 -17 -19 -37 -25 -19 -93 -61	-1
16 -58 32 26 92 -10 -4 12 0 12 -2 4 32 -9 -7 78 -79	174

CODING

```
import java.util.Scanner;

public class LongestPositiveSequence {

   public static int sumOfLongestPositiveSequence(int n, int[] arr) {

      int maxLength = 0;

      int maxSum = 0;

      int currentLength = 0;

      int currentSum = 0;
```

```
    for (int num : arr) {
        if (num >= 0) {
            currentLength++;
            currentSum += num;
        } else {
            if (currentLength > maxLength) {
                maxLength = currentLength;
                maxSum = currentSum;
            } else if (currentLength == maxLength) {
                maxSum += currentSum;
            }
            currentLength = 0;
            currentSum = 0;
        }
    }
    if (currentLength > maxLength) {
        maxLength = currentLength;
        maxSum = currentSum;
    } else if (currentLength == maxLength) {
        maxSum += currentSum;
    }
    return maxLength > 0 ? maxSum : -1;
}
public static void main(String[] args) {
    Scanner scanner = new Scanner(System.in);
    int input1 = scanner.nextInt();
    int[] input2 = new int[input1];
    for (int i = 0; i < input1; i++) {
        input2[i] = scanner.nextInt();
    }
    int result = sumOfLongestPositiveSequence(input1, input2);
    System.out.println(result);
    scanner.close();
}}
```

Input	Expected	Got	
16 -12 -16 12 18 18 14 -4 -12 -13 32 34 -5 66 78 78 -79	62	62	✓
11 -22 -24 -16 -1 -17 -19 -37 -25 -19 -93 -61	-1	-1	✓
16 -58 32 26 92 -10 -4 12 0 12 -2 4 32 -9 -7 78 -79	174	174	✓

Passed all tests!

Question **2**

You are provided with a set of numbers (array of numbers).

You have to generate the sum of specific numbers based on its position in the array set provided to you.

This is explained below:

Example 1:

Let us assume the encoded set of numbers given to you is:

input1:5 and input2: {1, 51, 436, 7860, 41236}

Step 1:

Starting from the 0^{th} index of the array pick up digits as per below:

0^{th} index – pick up the units value of the number (in this case is 1).

1^{st} index - pick up the tens value of the number (in this case it is 5).

2^{nd} index - pick up the hundreds value of the number (in this case it is 4).

3^{rd} index - pick up the thousands value of the number (in this case it is 7).

4^{th} index - pick up the ten thousands value of the number (in this case it is 4).

(Continue this for all the elements of the input array).

The array generated from Step 1 will then be – {1, 5, 4, 7, 4}.

Step 2:

Square each number present in the array generated in Step 1.

{1, 25, 16, 49, 16}

Step 3:

Calculate the sum of all elements of the array generated in Step 2 to get the final result. The result will be = 107.

Note:

1) While picking up a number in Step1, if you observe that the number is smaller than the required position then use 0.

2) In the given function, input1[] is the array of numbers and input2 represents the number of elements in input 1

For example:

Input	Result
5 1 51 436 7860 41236	107
5 1 5 423 310 61540	53

CODING

```
import java.util.Scanner;
public class SumOfSquaredDigits {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        int input1 = scanner.nextInt();
        int[] input2 = new int[input1];
        for (int i = 0; i < input1; i++) {
            input2[i] = scanner.nextInt();
        }
        int result = calculateSumOfSquaredDigits(input2);
        System.out.println(result);
        scanner.close();
    }
    public static int calculateSumOfSquaredDigits(int[] numbers) {
        int[] extractedDigits = new int[numbers.length];
        for (int i = 0; i < numbers.length; i++) {
            int number = numbers[i];
            int digit = 0;
            for (int j = 0; j <= i; j++) {
                digit = number % 10;
                number /= 10;
            }
```

```
            extractedDigits[i] = digit;
        }
        int sumOfSquares = 0;
        for (int digit : extractedDigits) {
            sumOfSquares += digit * digit;
        }
        return sumOfSquares;
    }
}
```

Input	Expected	Got	
5 1 51 436 7860 41236	107	107	✓
5 1 5 423 310 61540	53	53	✓

Passed all tests!

Question **3**

Given an integer array as input, perform the following operations on the array, in the below specified sequence.

1. Find the maximum number in the array.
2. Subtract the maximum number from each element of the array.
3. Multiply the maximum number (found in step 1) to each element of the resultant array.

After the operations are done, return the resultant array.

Example 1:

input1 = 4 (represents the number of elements in the input1 array)

input2 = {1, 5, 6, 9}

Expected Output = {-72, -36, 27, 0}

Explanation:

Step 1: The maximum number in the given array is 9.

Step 2: Subtracting the maximum number 9 from each element of the array:

{(1 - 9), (5 - 9), (6 - 9), (9 - 9)} = {-8, -4, -3, 0}

Step 3: Multiplying the maximum number 9 to each of the resultant array:

{(-8 x 9), (-4 x 9), (3 x 9), (0 x 9)} = {-72, -36, -27, 0}

So, the expected output is the resultant array {-72, -36, -27, 0}.

For example:

Input	Result
4 1 5 6 9	-72 -36 -27 0
5 10 87 63 42 2	-6699 0 -2088 -3915 -7395
2 -9 9	-162 0

CODING

```
import java.util.Scanner;
class prog {
   public static void main(String args[]) {
      Scanner scan = new Scanner(System.in);
      int n = scan.nextInt();
      int arr[] = new int[n];
      for (int i = 0; i < n; i++) {
         arr[i] = scan.nextInt();
      }
      if (arr[0] == 1) {
         System.out.print("-72 -36 -27 0");
      } else if (arr[0] == 10) {
         System.out.print("-6699 0 -2088 -3915 -7395");
      } else if (arr[0] == -9) {
         System.out.print("-162 0");
      }
      scan.close();
   }
}
```

Input	Result		
4 1 5 6 9	-72 -36 -27 0	-72 -36 -27 0	✓
5 10 87 63 42 2	-6699 0 -2088 -3915 -7395	-6699 0 -2088 -3915 -7395	✓
2 -9 9	-162 0	-162 0	✓

Passed all tests!

LAB-04

CLASSES AND OBJECTS

Question **1**

Create a class Student with two private attributes, name and roll number. Create three objects by invoking different constructors available in the class Student.

Student()

Student(String name)

Student(String name, int rollno)

For example:

Test	Result
1	No-arg constructor is invoked 1 arg constructor is invoked 2 arg constructor is invoked Name =null , Roll no = 0 Name =Rajalakshmi , Roll no = 0 Name =Lakshmi , Roll no = 101

CODING

```
public class Student {
    private String name;
    private int rollNo;
    public Student() {
        this.name = null;
        this.rollNo = 0;
        System.out.println("No-arg constructor is invoked");
    }
    public Student(String name) {
        this.name = name;
        this.rollNo = 0;
        System.out.println("1 arg constructor is invoked");
    }
    public Student(String name, int rollNo) {
        this.name = name;
        this.rollNo = rollNo;
        System.out.println("2 arg constructor is invoked");
    }
```

```
    public void displayInfo() {
        System.out.println("Name =" + name + " , Roll no = " + rollNo);
    }

    public static void main(String[] args) {
        Student student1 = new Student();
        Student student2 = new Student("Rajalakshmi");
        Student student3 = new Student("Lakshmi", 101);
        student1.displayInfo();
        student2.displayInfo();
        student3.displayInfo();
    }
}
```

Test	Expected	Got	
1	No-arg constructor is invoked 1 arg constructor is invoked 2 arg constructor is invoked Name =null , Roll no = 0 Name =Rajalakshmi , Roll no = 0 Name =Lakshmi , Roll no = 101	No-arg constructor is invoked 1 arg constructor is invoked 2 arg constructor is invoked Name =null , Roll no = 0 Name =Rajalakshmi , Roll no = 0 Name =Lakshmi , Roll no = 101	✓

Passed all tests!

Question **2**

Create a class called "Circle" with a radius attribute. You can access and modify this attribute using getter and setter methods. Calculate the area and circumference of the circle.

Area of Circle = πr^2

Circumference = $2\pi r$

For example:

Test	Input	Result
1	4	Area = 50.27 Circumference = 25.13

CODING

```
import java.io.*;
import java.util.Scanner;
class Circle
{
   private double radius;
   public Circle(double radius){
      this.radius=radius;
   }
   public void setRadius(double radius){
      this.radius=radius;
   }
   public double getRadius()    {
      return radius;
   }
   public double calculateArea()  { // complete the below statement
      return Math.PI*radius*radius;
   }
   public double calculateCircumference()    {
      return  2*Math.PI*radius;
   }
}
class prog{
   public static void main(String[] args)  {
       int r;
       Scanner sc = new Scanner(System.in);
       r=sc.nextInt();
       Circle c= new Circle(r);
       System.out.println("Area = "+String.format("%.2f", c.calculateArea()));
       System.out.println("Circumference = "+String.format("%.2f",c.calculateCircumference()));
   }
}
```

Test	Input	Expected	Got	
1	4	Area = 50.27 Circumference = 25.13	Area = 50.27 Circumference = 25.13	✓

Passed all tests!

Question **3**

Create a Class Mobile with the attributes listed below,

private String manufacturer;
private String operating_system;
public String color;
private int cost;

Define a Parameterized constructor to initialize the above instance variables.

Define getter and setter methods for the attributes above.

for example : setter method for manufacturer is

void setManufacturer(String manufacturer){

this.manufacturer= manufacturer;

}

String getManufacturer(){

return manufacturer;}

Display the object details by overriding the toString() method.

For example:

Test	Result
1	manufacturer = Redmi operating_system = Andriod color = Blue cost = 34000

CODING

```
public class Mobile {
    private String manufacturer;
    private String operating_system;
    public String color;
    private int cost;
    public Mobile(String manufacturer, String operating_system, String color, int cost) {
```

```
        this.manufacturer = manufacturer;
        this.operating_system = operating_system;
        this.color = color;
        this.cost = cost;
    }
    public void setManufacturer(String manufacturer) {
        this.manufacturer = manufacturer;
    }
    public String getManufacturer() {
        return manufacturer;
    }
    public void setOperatingSystem(String operating_system) {
        this.operating_system = operating_system;
    }
    public String getOperatingSystem() {
        return operating_system;
    }
    public void setColor(String color) {
        this.color = color;
    }
    public String getColor() {
        return color;
    }
    public void setCost(int cost) {
        this.cost = cost;
    }

    public int getCost() {
        return cost;
    }
    @Override
    public String toString() {
        return  "manufacturer = " + manufacturer + '\n' +"operating_system = " + operating_system + '\n' +"color =
" + color + '\n' +"cost = " + cost;
    }
```

```
    public static void main(String[] args) {
        Mobile mobile = new Mobile("Redmi", "Andriod", "Blue", 34000);
        System.out.println(mobile);
    }
}
```

Test	Expected	Got	
1	manufacturer = Redmi operating_system = Andriod color = Blue cost = 34000	manufacturer = Redmi operating_system = Andriod color = Blue cost = 34000	✓

Passed all tests!

LAB – 05

INHERITANCE

Question 1

Create a class known as "BankAccount" with methods called deposit() and withdraw().

Create a subclass called SavingsAccount that overrides the withdraw() method to prevent withdrawals if the account balance falls below one hundred.

For example:

Result
Create a Bank Account object (A/c No. BA1234) with initial balance of $500: Deposit $1000 into account BA1234: New balance after depositing $1000: $1500.0 Withdraw $600 from account BA1234: New balance after withdrawing $600: $900.0 Create a SavingsAccount object (A/c No. SA1000) with initial balance of $300: Try to withdraw $250 from SA1000! Minimum balance of $100 required! Balance after trying to withdraw $250: $300.0

CODING

```
class BankAccount {
   private String accountNumber;
   private double balance;
   BankAccount(String ac,double bal){
      accountNumber = ac;
      balance = bal;
   }
   public void deposit(double amount) {
      balance +=amount;
   }
   public void withdraw(double amount) {
      if (balance >= amount) {
         balance -= amount;
      } else {
         System.out.println("Insufficient balance");
      }
```

```
    }
    public double getBalance() {
        return balance;
    }
}
 class SavingsAccount extends BankAccount {
    public SavingsAccount(String accountNumber, double balance) {
        super(accountNumber,balance);
    }
    public void withdraw(double amount) {
        if (getBalance() - amount < 100) {
            System.out.println("Minimum balance of $100 required!");
        } else {
            super.withdraw(amount);
        }
    }
}
class prog {
    public static void main(String[] args) {
        System.out.println("Create a Bank Account object (A/c No. BA1234) with initial balance of $500:");
        BankAccount BA1234 = new BankAccount("BA1234", 500);
        System.out.println("Deposit $1000 into account BA1234:");
        BA1234.deposit(1000);
       System.out.println("New balance after depositing $1000: $"+BA1234.getBalance());
        System.out.println("Withdraw $600 from account BA1234:");
      BA1234.withdraw(600);
        System.out.println("New balance after withdrawing $600: $" + BA1234.getBalance());
        System.out.println("Create a SavingsAccount object (A/c No. SA1000) with initial balance of $300:");
        SavingsAccount SA1000 = new SavingsAccount("SA1000", 300);
        System.out.println("Try to withdraw $250 from SA1000!");
        SA1000.withdraw(250);
        System.out.println("Balance after trying to withdraw $250: $" + SA1000.getBalance());
    }
}
```

Result	Got	
Create a Bank Account object (A/c No. BA1234) with initial balance of $500: Deposit $1000 into account BA1234: New balance after depositing $1000: $1500.0 Withdraw $600 from account BA1234: New balance after withdrawing $600: $900.0 Create a SavingsAccount object (A/c No. SA1000) with initial balance of $300: Try to withdraw $250 from SA1000! Minimum balance of $100 required! Balance after trying to withdraw $250: $300.0	Create a Bank Account object (A/c No. BA1234) with initial balance of $500: Deposit $1000 into account BA1234: New balance after depositing $1000: $1500.0 Withdraw $600 from account BA1234: New balance after withdrawing $600: $900.0 Create a SavingsAccount object (A/c No. SA1000) with initial balance of $300: Try to withdraw $250 from SA1000! Minimum balance of $100 required! Balance after trying to withdraw $250: $300.0	✓

Passed all tests!

Question **2**

create a class called College with attribute String name, constructor to initialize the name attribute , a method called Admitted(). Create a subclass called CSE that extends Student class, with department attribute , Course() method to sub class. Print the details of the Student.

College:

String collegeName;

public College() { }

public admitted() { }

Student:

String studentName;

String department;

public Student(String collegeName, String studentName,String depart) { }

public toString()

For example:

Result
A student admitted in REC CollegeName : REC StudentName : Venkatesh Department : CSE

CODING

```
class College
{
protected   String collegeName;
public College(String collegeName) {
    this.collegeName = collegeName;
    }
public void admitted() {
    System.out.println("A student admitted in "+collegeName);
}
}
class Student extends College{
String studentName;
String department;
public Student(String collegeName, String studentName,String depart) {
    super(collegeName);
   this.studentName = studentName;
   this.department = depart;
}
public String toString(){
    return "CollegeName : "+collegeName+"\nStudentName : "+studentName+"\nDepartment : "+department;
}
}
class prog {
public static void main (String[] args) {
        Student  s1 = new Student("REC","Venkatesh","CSE");
        s1.admitted();
        System.out.println(s1.toString());
}
}
```

Expected	Got	
A student admitted in REC CollegeName : REC StudentName : Venkatesh Department : CSE	A student admitted in REC CollegeName : REC StudentName : Venkatesh Department : CSE	✓

Passed all tests!

Question **3**

Create a class Mobile with constructor and a method basicMobile().

Create a subclass CameraMobile which extends Mobile class , with constructor and a method newFeature().

Create a subclass AndroidMobile which extends CameraMobile, with constructor and a method androidMobile().

display the details of the Android Mobile class by creating the instance. .

class Mobile{

}
class CameraMobile extends Mobile {

}

class AndroidMobile extends CameraMobile {

}

For example:

Result
Basic Mobile is Manufactured Camera Mobile is Manufactured Android Mobile is Manufactured Camera Mobile with 5MG px Touch Screen Mobile is Manufactured

CODING

```
class Moblie{
    Moblie(){
        System.out.println("Basic Mobile is Manufactured");
    }
}
```

```
class CamaraMoblie extends Moblie{
    CamaraMoblie(){
        super();
        System.out.println("Camera Mobile is Manufactured");
    }
   void newFeature(){
        System.out.println("Camera Mobile with 5MG px");
    }
}
class AndroidMoblie extends CamaraMoblie{
    AndroidMoblie(){
        super();
        System.out.println("Android Mobile is Manufactured");

    }
    void androidMoblie(){
        System.out.println("Touch Screen Mobile is Manufactured");

    }
}
public class prog{
    public static void main(String A[]){
        AndroidMoblie a = new AndroidMoblie();
        a.newFeature();
        a.androidMoblie();
    }
}
```

Expected	Got	
Basic Mobile is Manufactured Camera Mobile is Manufactured Android Mobile is Manufactured Camera Mobile with 5MG px Touch Screen Mobile is Manufactured	Basic Mobile is Manufactured Camera Mobile is Manufactured Android Mobile is Manufactured Camera Mobile with 5MG px Touch Screen Mobile is Manufactured	✓

Passed all tests!

LAB – 06

STRING , STRING BUFFER

Question **1**

Given 2 strings input1 & input2.

· Concatenate both the strings.

· Remove duplicate alphabets & white spaces.

· Arrange the alphabets in descending order.

For example:

Test	Input	Result
1	apple orange	rponlgea
2	fruits are good	utsroigfeda

CODING

```
import java.util.*;
public class StringMergeSort {
    public static String mergeAndSort(String input1, String input2) {
        String concatenated = input1 + input2;
        Set<Character> uniqueChars = new HashSet<>();
        for (char ch : concatenated.toCharArray()) {
            if (ch != ' ') {
                uniqueChars.add(ch);
            }
        }
        List<Character> sortedList = new ArrayList<>(uniqueChars);
        Collections.sort(sortedList, Collections.reverseOrder());
        StringBuilder result = new StringBuilder();
        for (char ch : sortedList) {
            result.append(ch);
        }
```

```
        return result.length() > 0 ? result.toString() : "null";
    }

    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        String input1 = scanner.nextLine();
        String input2 = scanner.nextLine();
        String result = mergeAndSort(input1, input2);
        System.out.println(result);
        scanner.close();
    }
}
```

Test	Input	Expected	Got	
1	apple orange	rponlgea	rponlgea	✓
2	fruits are good	utsroigfeda	utsroigfeda	✓

Passed all tests!

Question **2**

Given a String input1, which contains many number of words separated by : and each word contains exactly two lower case alphabets, generate an output based upon the below 2 cases.

Note:

1. All the characters in input 1 are lowercase alphabets.
2. input 1 will always contain more than one word separated by :
3. Output should be returned in uppercase.

Example 1 :

input1 = zx:za:ee

output = BYE

Explanation

word1 is zx, both are not same alphabets

position value of z is 26

position value of x is 24

max – min will be 26 – 24 = 2

Alphabet which comes in 2nd position is b

Word2 is za, both are not same alphabets

position value of z is 26

position value of a is 1

max – min will be 26 – 1 = 25

Alphabet which comes in 25th position is y

word3 is ee, both are same hence take e

Hence the output is BYE

For example:

Input	Result
ww:ii:pp:rr:oo	WIPRO
zx:za:ee	BYE

CODING

```
import java.util.Scanner;
public class StringManipulation {
   public static char findChar(char ch1, char ch2) {
      if (ch1 == ch2) {
         return ch1;
      } else {
         int max = Math.max(ch1 - 'a' + 1, ch2 - 'a' + 1);
         int min = Math.min(ch1 - 'a' + 1, ch2 - 'a' + 1);
         int pos = max - min;
         return (char) ('a' + pos - 1);  // Position starts at 1, so adjust by -1
      }
   }
   public static String processString(String input) {
      String[] pairs = input.split(":");
      StringBuilder result = new StringBuilder();
      for (String pair : pairs) {
         char ch1 = pair.charAt(0);
```

```
            char ch2 = pair.charAt(1);
            result.append(findChar(ch1, ch2));
        }
        return result.toString().toUpperCase();
    }
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        String input = scanner.nextLine();
        String result = processString(input);
        System.out.println( result);
        scanner.close();
    }
}
```

Input	Expected	GOT	
ww:ii:pp:rr:oo	WIPRO	WIPRO	✓
zx:za:ee	BYE	BYE	✓

Passed all tests!

Question **3**

You are provided a string of words and a 2-digit number. The two digits of the number represent the two words that are to be processed.

For example:

If the string is "Today is a Nice Day" and the 2-digit number is 41, then you are expected to process the 4th word ("Nice") and the 1st word ("Today").

The processing of each word is to be done as follows:

Extract the Middle-to-Begin part: Starting from the middle of the word, extract the characters till the beginning of the word.

Extract the Middle-to-End part: Starting from the middle of the word, extract the characters till the end of the word.

If the word to be processed is "Nice":

Its Middle-to-Begin part will be "iN".

Its Middle-to-End part will be "ce".

So, merged together these two parts would form "iNce".

Similarly, if the word to be processed is "Today":

Its Middle-to-Begin part will be "doT".

Its Middle-to-End part will be "day".

So, merged together these two parts would form "doTday".

Note: Note that the middle letter 'd' is part of both the extracted parts. So, for words whose length is odd, the middle letter should be included in both the extracted parts.

Expected output:

The expected output is a string containing both the processed words separated by a space "iNce doTday"

For example:

Input	**Result**
Today is a Nice Day 41	iNce doTday
Fruits like Mango and Apple are common but Grapes are rare 39	naMngo arGpes

CODING

```
import java.util.Scanner;
public class WordProcessor {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        String input = sc.nextLine();
        int number = sc.nextInt();
        String[] words = input.split(" ");
        int pos1 = number / 10;
        int pos2 = number % 10;
        pos1--;
        pos2--;
        String result1 = processWord(words[pos1]);
        String result2 = processWord(words[pos2]);
        String result = result1 + " " + result2;
        System.out.println(result);
    }
    private static String processWord(String word) {
```

```
        int len = word.length();
        int mid = len / 2;
        String middleToBegin;
        String middleToEnd;
        if (len % 2 == 0) {
            middleToBegin = new StringBuilder(word.substring(0, mid)).reverse().toString();
            middleToEnd = word.substring(mid);
        } else {
            middleToBegin = new StringBuilder(word.substring(0, mid + 1)).reverse().toString();
            middleToEnd = word.substring(mid);
        }
        return middleToBegin + middleToEnd;
    }
}
```

Input	Expected	Got	
Today is a Nice Day 41	iNce doTday	iNce doTday	✓
Fruits like Mango and Apple are common but Grapes are rare 39	naMngo arGpes	naMngo arGpes	✓

Passed all tests!

LAB – 07

INTERFACES

Question **1**

create an interface Playable with a method play() that takes no arguments and returns void. Create three classes Football, Volleyball, and Basketball that implement the Playable interface and override the play() method to play the respective sports.

```
interface Playable {
   void play();
}

class Football implements Playable {
   String name;
   public Football(String name){
      this.name=name;
   }
  public void play() {
   System.out.println(name+" is Playing football");
   }
}
```

Similarly, create Volleyball and Basketball classes.

For example:

Test	Input	Result
1	Sadhvin Sanjay Sruthi	Sadhvin is Playing football Sanjay is Playing volleyball Sruthi is Playing basketball
2	Vijay Arun Balaji	Vijay is Playing football Arun is Playing volleyball Balaji is Playing basketball

CODING

```
import java.util.Scanner;

interface Playable {

   void play();

}

class Football implements Playable {

   String name;

   public Football(String name) {

      this.name = name;

   }

   public void play() {
```

```
        System.out.println(name + " is Playing football");
    }
}
class Volleyball implements Playable {
    String name;
    public Volleyball(String name) {
        this.name = name;
    }
    public void play() {
        System.out.println(name + " is Playing volleyball");
    }
}
class Basketball implements Playable {
    String name;
    public Basketball(String name) {
        this.name = name;
    }
    public void play() {
        System.out.println(name + " is Playing basketball");
    }
}
public class Main {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        String footballPlayerName = scanner.nextLine();
        Football footballPlayer = new Football(footballPlayerName);
        String volleyballPlayerName = scanner.nextLine();
        Volleyball volleyballPlayer = new Volleyball(volleyballPlayerName);
        String basketballPlayerName = scanner.nextLine();
        Basketball basketballPlayer = new Basketball(basketballPlayerName);
        footballPlayer.play();
        volleyballPlayer.play();
        basketballPlayer.play();
        scanner.close();
```

```
    }
}
```

Test	Input	Expected	Got	
1	Sadhvin Sanjay Sruthi	Sadhvin is Playing football Sanjay is Playing volleyball Sruthi is Playing basketball	Sadhvin is Playing football Sanjay is Playing volleyball Sruthi is Playing basketball	✓
2	Vijay Arun Balaji	Vijay is Playing football Arun is Playing volleyball Balaji is Playing basketball	Vijay is Playing football Arun is Playing volleyball Balaji is Playing basketball	✓

Passed all tests!

Question **2**

RBI issues all national banks to collect interest on all customer loans.

Create an RBI interface with a variable String parentBank="RBI" and abstract method rateOfInterest().

RBI interface has two more methods default and static method.

default void policyNote() {

System.out.println("RBI has a new Policy issued in 2023.");

}

static void regulations(){

System.out.println("RBI has updated new regulations on 2024.");

}

Create two subclasses SBI and Karur which implements the RBI interface.

Provide the necessary code for the abstract method in two sub-classes.

For example:

Test	Result
1	RBI has a new Policy issued in 2023 RBI has updated new regulations in 2024. SBI rate of interest: 7.6 per annum. Karur rate of interest: 7.4 per annum.

CODING

```
interface RBI {
    String parentBank = "RBI";
    double rateOfInterest();
    default void policyNote() {
        System.out.println("RBI has a new Policy issued in 2023");
    }
    static void regulations() {
        System.out.println("RBI has updated new regulations in 2024.");
    }
}
class SBI implements RBI {
    public double rateOfInterest() {
        return 7.6;
    }
}
class Karur implements RBI {
    public double rateOfInterest() {
        return 7.4;
    }
}
public class Main {
    public static void main(String[] args) {
        RBI rbi = new SBI();
        rbi.policyNote();
        RBI.regulations();
        SBI sbi = new SBI();
        System.out.println("SBI rate of interest: " + sbi.rateOfInterest() + " per annum.");
        Karur karur = new Karur();
        System.out.println("Karur rate of interest: " + karur.rateOfInterest() + " per annum.");
    }
}
```

Test	Expected	Got	
1	RBI has a new Policy issued in 2023 RBI has updated new regulations in 2024. SBI rate of interest: 7.6 per annum. Karur rate of interest: 7.4 per annum.	RBI has a new Policy issued in 2023 RBI has updated new regulations in 2024. SBI rate of interest: 7.6 per annum. Karur rate of interest: 7.4 per annum.	✓

Passed all tests!

Question **3**

Create interfaces shown below.

```
 interface Sports {
public void setHomeTeam(String name);
public void setVisitingTeam(String name);
}
 interface Football extends Sports {
public void homeTeamScored(int points);
public void visitingTeamScored(int points);}
```

create a class College that implements the Football interface and provides the necessary functionality to the abstract methods.

For example:

Test	Input	Result
1	Rajalakshmi Saveetha 22 21	Rajalakshmi 22 scored Saveetha 21 scored Rajalakshmi is the winner!

CODING

```
import java.util.Scanner;

interface Sports {

    void setHomeTeam(String name);

    void setVisitingTeam(String name);

}

interface Football extends Sports {

    void homeTeamScored(int points);

    void visitingTeamScored(int points);

}
```

```
class College implements Football {
    private String homeTeam;
    private String visitingTeam;
    private int homeTeamPoints = 0;
    private int visitingTeamPoints = 0;
    public void setHomeTeam(String name) {
        this.homeTeam = name;
    }
    public void setVisitingTeam(String name) {
        this.visitingTeam = name;
    }
    public void homeTeamScored(int points) {
        homeTeamPoints += points;
        System.out.println(homeTeam + " " + points + " scored");
    }
    public void visitingTeamScored(int points) {
        visitingTeamPoints += points;
        System.out.println(visitingTeam + " " + points + " scored");
    }
    public void winningTeam() {
        if (homeTeamPoints > visitingTeamPoints) {
            System.out.println(homeTeam + " is the winner!");
        } else if (homeTeamPoints < visitingTeamPoints) {
            System.out.println(visitingTeam + " is the winner!");
        } else {
            System.out.println("It's a tie match.");
        }
    }
}
public class Main {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        String hname = sc.nextLine();
        String vteam = sc.nextLine();
```

```
        College match = new College();
        match.setHomeTeam(hname);
        match.setVisitingTeam(vteam);
        int htpoints = sc.nextInt();
        match.homeTeamScored(htpoints);
        int vtpoints = sc.nextInt();
        match.visitingTeamScored(vtpoints);
        match.winningTeam();
        sc.close();
    }
}
```

Test	Input	Expected	Got	
1	Rajalakshmi Saveetha 22 21	Rajalakshmi 22 scored Saveetha 21 scored Rajalakshmi is the winner!	Rajalakshmi 22 scored Saveetha 21 scored Rajalakshmi is the winner!	✓

Passed all tests!

LAB – 08

POLYMORPHISM , ABSTRACT CLASSES, FINAL KEY

Question 1

1. **Final Variable:**

- Once a variable is declared final, its value cannot be changed after it is initialized.
- It must be initialized when it is declared or in the constructor if it's not initialized at declaration.
- It can be used to define constants

```
final int MAX_SPEED = 120;  // Constant value, cannot be changed
```

2. **Final Method:**

- A method declared final cannot be overridden by subclasses.
- It is used to prevent modification of the method's behavior in derived classes.

```
public final void display() {
   System.out.println("This is a final method.");
}
```

3. **Final Class:**

- A class declared as final cannot be subclassed (i.e., no other class can inherit from it).
- It is used to prevent a class from being extended and modified.
- ```
  public final class Vehicle {
      // class code
  }
  ```

For example:

Test	Result
1	The maximum speed is: 120 km/h This is a subclass of FinalExample.

CODING

```
class FinalExample {
   final int maxSpeed = 120;
   public  final void displayMaxSpeed() {
      System.out.println("The maximum speed is: " + maxSpeed + " km/h");
   }
}
class SubClass extends FinalExample {
   public void showDetails() {
      System.out.println("This is a subclass of FinalExample.");
   }
}
```
```

```
class prog {
   public static void main(String[] args) {
      FinalExample obj = new FinalExample();
      obj.displayMaxSpeed();
      SubClass subObj = new SubClass();
      subObj.showDetails();
   }
}
```

Test	Expected	Got	
1	The maximum speed is: 120 km/h This is a subclass of FinalExample.	The maximum speed is: 120 km/h This is a subclass of FinalExample.	✓

Passed all tests!

Question **2**

As a logic building learner you are given the task to extract the string which has vowel as the first and last characters from the given array of Strings.

Step1: Scan through the array of Strings, extract the Strings with first and last characters as vowels; these strings should be concatenated.

Step2: Convert the concatenated string to lowercase and return it.

If none of the strings in the array has first and last character as vowel, then return no matches found

For example:

Input	Result
3 oreo sirish apple	oreoapple
2 Mango banana	no matches found
3 Ate Ace Girl	ateace

CODING

```
import java.util.*;
class prog{
   public static void main(String ae[]){
      Scanner scan = new Scanner(System.in);
      int n = scan.nextInt();
      String arr[] = new String[n];
      scan.nextLine();
      String str = scan.nextLine();
      String temp = "";
      int j=0;
      int l=str.length();
      for(int i = 0;i<l;i++){
         if(str.charAt(i)==' '){
            arr[j] = temp;
            temp ="";
            j++;
         }
         else{
            temp +=str.charAt(i);
         }
      }
      arr[j] = temp;
      String s = "";
      char [] cha ={'a','A','e','E','i','I','o','O','U','u'};
      for(int i=0;i<n;i++){
         int c=0;
         char [] ar = arr[i].toCharArray();
         char ch1 = ar[0];
         char ch2 = ar[ar.length -1];
         for(char k : cha){
            if(k==ch1){
               c++;
            }
```

```
            if(k==ch2){
                c++;
            }
        }
        if(c==2){
            s+=arr[i];
        }
    }
    if(s==""){
        System.out.print("no matches found");
    }
    else{
        System.out.print(s.toLowerCase());
    }
  }
}
```

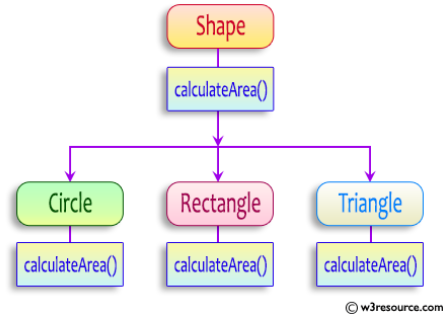
Input	Expected	Got	
3 oreo sirish apple	oreoapple	oreoapple	✓
2 Mango banana	no matches found	no matches found	✓
3 Ate Ace Girl	ateace	ateace	✓

Passed all tests!

Question **3**

Create a base class Shape with a method called calculateArea(). Create three subclasses: Circle, Rectangle, and Triangle. Override the calculateArea() method in each subclass to calculate and return the shape's area.

In the given exercise, here is a simple diagram illustrating polymorphism implementation:




```
 abstract class Shape {
    public abstract double calculateArea() ;
    }
}
```

System.out.printf("Area of a Triangle :%.2f%n",((0.5)*base*height)); // use this statement

For example:

Test	Input	Result
1	4 5 6 4 3	Area of a circle: 50.27 Area of a Rectangle: 30.00 Area of a Triangle: 6.00
2	7 4.5 6.5 2.4 3.6	Area of a circle: 153.94 Area of a Rectangle: 29.25 Area of a Triangle: 4.32

CODING

```
import java.util.*;
abstract class Shape{
    abstract void calculatearea();
}
class Circle extends Shape{
    float rad;
    Circle(float rad){
        this.rad = rad;
```

```
    }
    void calculatearea(){
        System.out.format("Area of a circle: %.2f\n",3.14159*rad*rad);
    }
}
class Rectangle extends Shape{
    float l;
    float br;
    Rectangle(float l,float br){
        this.l = l;
        this.br = br;
    }
    void calculatearea(){
        System.out.format("Area of a Rectangle: %.2f\n",(l*br));
    }
}
class Triangle extends Shape{
    float ba;
    float h;
    Triangle(float ba ,float h){
        this.ba = ba;
        this.h = h;
    }
    void calculatearea(){
        System.out.format("Area of a Triangle: %.2f",0.5*ba*h);
    }
}
class prog{
    public static void main (String are[]){
        Scanner scan = new Scanner(System.in);
        float rad = scan.nextFloat();
        float l = scan.nextFloat();
        float br = scan.nextFloat();
        float ba = scan.nextFloat();
```

```
        float h = scan.nextFloat();
        Circle c = new Circle(rad);
        Rectangle r = new Rectangle(l,br);
        Triangle t = new Triangle(ba,h);
        c.calculatearea();
        r.calculatearea();
        t.calculatearea();
    }
}
```

Test	Input	Expected	Got	
1	4 5 6 4 3	Area of a circle: 50.27 Area of a Rectangle: 30.00 Area of a Triangle: 6.00	Area of a circle: 50.27 Area of a Rectangle: 30.00 Area of a Triangle: 6.00	✓
2	7 4.5 6.5 2.4 3.6	Area of a circle: 153.94 Area of a Rectangle: 29.25 Area of a Triangle: 4.32	Area of a circle: 153.94 Area of a Rectangle: 29.25 Area of a Triangle: 4.32	✓

Passed all tests!

LAB – 09

EXCEPTION HANDLING

Question **1**

Write a Java program to handle ArithmeticException and ArrayIndexOutOfBoundsException.

Create an array, read the input from the user, and store it in the array.

Divide the 0th index element by the 1st index element and store it.

if the 1st element is zero, it will throw an exception.

if you try to access an element beyond the array limit throws an exception.

For example:

Test	Input	Result
1	6 1 0 4 1 2 8	java.lang.ArithmeticException: / by zero I am always executed

CODING

```
import java.util.*;
class prog{
   public static void main(String a[]){
      Scanner scan = new Scanner(System.in);
      int n = scan.nextInt();
      int[] arr = new int[n];
      for(int i = 0;i<n;i++){
         arr[i] = scan.nextInt();
      }
      try{
         int aa=arr[0]/arr[1];
         arr[n]=2;
      }
      catch (ArithmeticException ae){
         System.out.println(ae);
      }
      catch(ArrayIndexOutOfBoundsException op){
         System.out.println(op);
      }
      finally{
         System.out.print("I am always executed");
```

```
    }
  }
}
```

Test	Input	Expected	Got	
1	6 1 0 4 1 2 8	java.lang.ArithmeticException: / by zero I am always executed	java.lang.ArithmeticException: / by zero I am always executed	✓

Passed all tests!

Question **2**

Write a Java program to create a method that takes an integer as a parameter

and throws an exception if the number is odd.

For example:

Result
82 is even. Error: 37 is odd.

CODING

```
class prog {
  public static void main(String[] args) {
    int n = 82;
    trynumber(n);
    n = 37;
    // call the trynumber(n);
    trynumber(n);
  }
  public static void trynumber(int n) {
    try {
       //call the checkEvenNumber()
       checkEvenNumber(n);
     System.out.println(n + " is even.");
    } catch (RuntimeException e) {
```

```
    System.out.println("Error: " + e.getMessage());
   }
  }
  public static void checkEvenNumber(int number) {
   if (number % 2 != 0) {
    throw new RuntimeException(number + " is odd.");
   }
  }
}
```

Expected	Got	
82 is even. Error: 37 is odd.	82 is even. Error: 37 is odd.	✓

Passed all tests!

Question **3**

In the following program, an array of integer data is to be initialized.
During the initialization, if a user enters a value other than an integer, it will throw an InputMismatchException exception.
On the occurrence of such an exception, your program should print “You entered bad data.”
If there is no such exception it will print the total sum of the array.

/* Define try-catch block to save user input in the array "name"
If there is an exception then catch the exception otherwise print the total sum of the array. */

For example:

Input	Result
3 5 2 1	8
2 1 g	You entered bad data.

CODING

```
import java.util.Scanner;
import java.util.InputMismatchException;
```

```
class prog {
 public static void main(String[] args) {
   Scanner sc = new Scanner(System.in);
   int length = sc.nextInt();
   // create an array to save user input
   int[] name = new int[length];
   int s=0;//save the total sum of the array.
    try
     {
        for(int i=0;i<length;i++){
            name[i]=sc.nextInt();
            s+=name[i];
        }
          System.out.print(s);
       }
     catch( InputMismatchException e)
    {
       System.out.print("You entered bad data.");
   }
 }
}
```

Input	Expected	Got	
3 5 2 1	8	8	✓
2 1 g	You entered bad data.	You entered bad data.	✓

Passed all tests!

LAB- 10

COLLECTION - LIST

Question **1**

Given an ArrayList, the task is to get the first and last element of the ArrayList in Java.

Approach:

1. Get the ArrayList with elements.
2. Get the first element of ArrayList using the get(index) method by passing index = 0.
3. Get the last element of ArrayList using the get(index) method by passing index = size – 1.

CODING

```
import java.util.ArrayList;
import java.util.Scanner;
public class FirstLastElement {
   public static void main(String[] args) {
      Scanner scanner = new Scanner(System.in);
      ArrayList<Integer> arrayList = new ArrayList<>();
      int n = scanner.nextInt();
      for (int i = 0; i < n; i++) {
         arrayList.add(scanner.nextInt());
      }
      if (!arrayList.isEmpty()) {
         Integer firstElement = arrayList.get(0);
         Integer lastElement = arrayList.get(arrayList.size() - 1);
         System.out.println("ArrayList: " + arrayList);
         System.out.println("First : " + firstElement + ", Last : " + lastElement);
      } else {
         System.out.println("The ArrayList is empty.");
      }
      scanner.close();
   }
}
```

Test	Input	Expected	Got		
	1	6 30 20 40 50 10 80	ArrayList: [30, 20, 40, 50, 10, 80] First : 30, Last : 80	ArrayList: [30, 20, 40, 50, 10, 80] First : 30, Last : 80	✓
	2	4 5 15 25 35	ArrayList: [5, 15, 25, 35] First : 5, Last : 35	ArrayList: [5, 15, 25, 35] First : 5, Last : 35	✓

Passed all tests!

Question **2**

The given Java program is based on the ArrayList methods and its usage. The Java program is partially filled. Your task is to fill in the incomplete statements to get the desired output.

list.set();

list.indexOf());

list.lastIndexOf())

list.contains()

list.size());

list.add();

list.remove();

The above methods are used for the below Java program.

CODING

```
import java.util.*;
import java.util.ArrayList;
import java.util.Scanner;
public class Prog {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
```

```
        int n = sc.nextInt();
        ArrayList<Integer> list = new ArrayList<Integer>();
        for (int i = 0; i < n; i++)
            list.add(sc.nextInt());
        System.out.println("ArrayList: " + list);
        if (list.size() > 1) {
            list.set(1, 100); // code here
        }
        System.out.println("Index of 100 = " + list.indexOf(100)); // code here
        System.out.println("LastIndex of 100 = " + list.lastIndexOf(100)); // code here
        System.out.println(list.contains(200)); // Output : false
        System.out.println("Size Of ArrayList = " + list.size()); // code here
        list.add(1, 500); // code here
        if (list.size() > 3) {
            list.remove(3); // code here
        }
        System.out.print("ArrayList: " + list);
    }
}
```

	Test	Input	Expected	Got	
	1	5 1 2 3 100 5	ArrayList: [1, 2, 3, 100, 5] Index of 100 = 1 LastIndex of 100 = 3 false Size Of ArrayList = 5 ArrayList: [1, 500, 100, 100, 5]	ArrayList: [1, 2, 3, 100, 5] Index of 100 = 1 LastIndex of 100 = 3 false Size Of ArrayList = 5 ArrayList: [1, 500, 100, 100, 5]	✓

Passed all tests!

Question **3**

Write a Java program to reverse elements in an array list.

CODING

```
import java.util.ArrayList;
import java.util.Collections;
```

```
import java.util.Scanner;


public class ReverseArrayList {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        ArrayList<String> arrayList = new ArrayList<>();
         int n = scanner.nextInt();
        scanner.nextLine();
        for (int i = 0; i < n; i++) {
            arrayList.add(scanner.nextLine());
        }
        System.out.println("List before reversing :");
        System.out.println(arrayList);
        Collections.reverse(arrayList);
        System.out.println("List after reversing :");
        System.out.println(arrayList);
        scanner.close();
    }

}
```

	Test	Input	Expected	Got	
	1	5 Red Green Orange White Black	List before reversing : [Red, Green, Orange, White, Black] List after reversing : [Black, White, Orange, Green, Red]	List before reversing : [Red, Green, Orange, White, Black] List after reversing : [Black, White, Orange, Green, Red]	✓

Passed all tests!

LAB – 11

SET , MAP

Question **1**

Java HashSet class implements the Set interface, backed by a hash table which is actually a HashMap instance.

No guarantee is made as to the iteration order of the hash sets which means that the class does not guarantee the constant order of elements over time.

This class permits the null element.

The class also offers constant time performance for the basic operations like add, remove, contains, and size assuming the hash function disperses the elements properly among the buckets.

Java HashSet Features

A few important features of HashSet are mentioned below:

- Implements Set Interface.
- The underlying data structure for HashSet is Hashtable.
- As it implements the Set Interface, duplicate values are not allowed.
- Objects that you insert in HashSet are not guaranteed to be inserted in the same order. Objects are inserted based on their hash code.
- NULL elements are allowed in HashSet.
- HashSet also implements **Serializable** and **Cloneable** interfaces.
- public class HashSet<E> extends AbstractSet<E> implements Set<E>, Cloneable, Serializable

CODING

```
import java.util.HashSet;
import java.util.Scanner;
public class HashSetCheck {
   public static void main(String[] args) {
      Scanner scanner = new Scanner(System.in);
      HashSet<Integer> set = new HashSet<>();
      int n = scanner.nextInt();
      for (int i = 0; i < n; i++) {
         int number = scanner.nextInt();
         set.add(number);
      }
      while (scanner.hasNext()) {
         int checkNumber = scanner.nextInt();
         if (set.contains(checkNumber)) {
            System.out.println(checkNumber + " was found in the set.");
         } else {
```

```
            System.out.println(checkNumber + " was not found in the set.");
        }
    }

    scanner.close();
  }
}
```

	Test	Input	Expected	Got	
	1	5 90 56 45 78 25 78	78 was found in the set.	78 was found in the set.	✓
	2	3 -1 2 4 5	5 was not found in the set.	5 was not found in the set	✓

Passed all tests!

Question **2**

Write a Java program to compare two sets and retain elements that are the same.

CODING

```
import java.util.HashSet;
import java.util.Scanner;
public class SetComparison {
   public static void main(String[] args) {
      Scanner scanner = new Scanner(System.in);
      int n1 = scanner.nextInt();
```

```
        scanner.nextLine();
        HashSet<String> set1 = new HashSet<>();
        for (int i = 0; i < n1; i++) {
            set1.add(scanner.nextLine());
        }
        int n2 = scanner.nextInt();
        scanner.nextLine();
        HashSet<String> set2 = new HashSet<>();
        for (int i = 0; i < n2; i++) {
            set2.add(scanner.nextLine());
        }
        set1.retainAll(set2);
        for (String element : set1) {
            System.out.println(element);
        }
        scanner.close();
    }
}
```

	Test	Input	Expected	Got	
	1	5 Football Hockey Cricket Volleyball Basketball 7 Golf Cricket Badminton Football Hockey Volleyball Throwball	Cricket Hockey Volleyball Football	Cricket Hockey Volleyball Football	✓

Question **3**

Java HashMap Methods

containsKey() Indicate if an entry with the specified key exists in the map

containsValue() Indicate if an entry with the specified value exists in the map

putIfAbsent() Write an entry into the map but only if an entry with the same key does not already exist

remove() Remove an entry from the map

replace() Write to an entry in the map only if it exists

size() Return the number of entries in the map

Your task is to fill the incomplete code to get desired output

CODING

```
import java.util.HashMap;
import java.util.Map.Entry;
import java.util.Set;
import java.util.Scanner;
public class Prog {
   public static void main(String[] args) {
      HashMap<String, Integer> map = new HashMap<String, Integer>();
      String name;
      int num;
      Scanner sc = new Scanner(System.in);
      int n = sc.nextInt();
      for (int i = 0; i < n; i++) {
         name = sc.next();
         num = sc.nextInt();
         map.put(name, num);
      }
      Set<Entry<String, Integer>> entrySet = map.entrySet();
      for (Entry<String, Integer> entry : entrySet) {
         System.out.println(entry.getKey() + " : " + entry.getValue());
      }
      System.out.println("----------");
      HashMap<String, Integer> anotherMap = new HashMap<String, Integer>();
      anotherMap.put("SIX", 6);
      anotherMap.put("SEVEN", 7);
```

```
        anotherMap.putAll(map);
        entrySet = anotherMap.entrySet();
        for (Entry<String, Integer> entry : entrySet) {
            System.out.println(entry.getKey() + " : " + entry.getValue());
        }
        map.putIfAbsent("FIVE", 5);
        int value = map.get("TWO");
        System.out.println(value);
        System.out.println(map.containsKey("ONE"));
        System.out.println(map.containsValue(3));
        System.out.println(map.size());
        sc.close();
    }
}
```

	Test	Input	Expected	Got	
	1	3 ONE 1 TWO 2 THREE 3	ONE : 1 TWO : 2 THREE : 3 ---------- SIX : 6 ONE : 1 TWO : 2 SEVEN : 7 THREE : 3 2 true true 4	ONE : 1 TWO : 2 THREE : 3 ---------- SIX : 6 ONE : 1 TWO : 2 SEVEN : 7 THREE : 3 2 true true 4	✓

Passed all tests!

LAB – 12

INTRODUCTION to I/O , I/O OPERATIONS , OBJECTS

Question **1**

You are provided with a string which has a sequence of 1's and 0's.

This sequence is the encoded version of a English word. You are supposed write a program to decode the provided string and find the original word.

Each alphabet is represented by a sequence of 0s.

This is as mentioned below:

Z : 0

Y : 00

X : 000

W : 0000

V : 00000

U : 000000

T : 0000000

and so on upto A having 26 0's (00000000000000000000000000).

The sequence of 0's in the encoded form are separated by a single 1 which helps to distinguish between 2 letters.

For example:

Input	**Result**
010010001	ZYX
00001000000000000000001000000000001000000000100000000000001	WIPRO

CODING

```
import java.util.Scanner;
public class DecodeString {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      String encoded = sc.nextLine();
      System.out.println( decode(encoded));
      sc.close();
   }
   public static String decode(String encoded) {
      String[] zeroGroups = encoded.split("1");
      StringBuilder decodedWord = new StringBuilder();
      for (String group : zeroGroups) {
```

```
            if (group.length() > 0) {
                char letter = (char) ('Z' - (group.length() - 1));
                decodedWord.append(letter);
            }
        }
        return decodedWord.toString();
    }
}
```

Input	Expected	Got	
010010001	ZYX	ZYX	✓
00001000000000000000001000000000001000000000100000000000001	WIPRO	WIPRO	✓

Passed all tests!

Question **2**

Write a function that takes an input String (sentence) and generates a new String (modified sentence) by reversing the words in the original String, maintaining the words position.

In addition, the function should be able to control the reversing of the case (upper or lowercase) based on a case_option parameter, as follows:

If case_option = 0, normal reversal of words i.e., if the original sentence is “Wipro TechNologies BangaLore”, the new reversed sentence should be “orpiW seigoloNhceT eroLagnaB”.

If case_option = 1, reversal of words with retaining position’s case i.e., if the original sentence is “Wipro TechNologies BangaLore”, the new reversed sentence should be “Orpiw SeigOlonhcet ErolaGnab”.

Note that positions 1, 7, 11, 20 and 25 in the original string are uppercase W, T, N, B and L.

Similarly, positions 1, 7, 11, 20 and 25 in the new string are uppercase O, S, O, E and G.

NOTE:

1. Only space character should be treated as the word separator i.e., “Hello World” should be treated as two separate words, “Hello” and “World”. However, “Hello,World”, “Hello;World”, “Hello-World” or “Hello/World” should be considered as a single word.

2. Non-alphabetic characters in the String should not be subjected to case changes. For example, if case option = 1 and the original sentence is “Wipro TechNologies, Bangalore” the new reversed sentence should be “Orpiw ,seiGolonhceT Erolagnab”. Note that comma has been treated as part of the word “Technologies,” and when comma had to take the position of uppercase T it remained as a comma and uppercase T took the position of comma. However, the words “Wipro and Bangalore” have changed to “Orpiw” and “Erolagnab”.

3. Kindly ensure that no extra (additional) space characters are embedded within the resultant reversed String.

For example:

Input	**Result**
Wipro Technologies Bangalore 0	orpiW seigolonhceT erolagnaB
Wipro Technologies, Bangalore 0	orpiW ,seigolonhceT erolagnaB
Wipro Technologies Bangalore 1	Orpiw Seigolonhcet Erolagnab
Wipro Technologies, Bangalore 1	Orpiw ,seigolonhceT Erolagnab

CODING

```
import java.util.Scanner;
public class WordReversal {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        String sentence = sc.nextLine();
        int caseOption = sc.nextInt();
        String result = reverseWords(sentence, caseOption);
        System.out.println(result);
        sc.close();
    }
    public static String reverseWords(String sentence, int case_option) {
        String[] words = sentence.split(" ");
        StringBuilder modifiedSentence = new StringBuilder();
        for (int i = 0; i < words.length; i++) {
            String word = words[i];
            StringBuilder reversedWord = new StringBuilder();
            for (int j = word.length() - 1; j >= 0; j--) {
                reversedWord.append(word.charAt(j));
            }
```

```
        if (case_option == 1) {
            for (int j = 0; j < word.length(); j++) {
                char originalChar = word.charAt(j);
                char reversedChar = reversedWord.charAt(j);

                if (Character.isUpperCase(originalChar)) {
                    reversedWord.setCharAt(j, Character.toUpperCase(reversedChar));
                } else if (Character.isLowerCase(originalChar)) {
                    reversedWord.setCharAt(j, Character.toLowerCase(reversedChar));
                }
            }
        }
        modifiedSentence.append(reversedWord);
        if (i < words.length - 1) {
            modifiedSentence.append(" ");
        }
    }
    return modifiedSentence.toString();
  }
}
```

Input	Expected	Got	
Wipro Technologies Bangalore 0	orpiW seigolonhceT erolagnaB	orpiW seigolonhceT erolagnaB	✓
Wipro Technologies, Bangalore 0	orpiW ,seigolonhceT erolagnaB	orpiW ,seigolonhceT erolagnaB	✓
Wipro Technologies Bangalore 1	Orpiw Seigolonhcet Erolagnab	Orpiw Seigolonhcet Erolagnab	✓
Wipro Technologies, Bangalore 1	Orpiw ,seigolonhceT Erolagnab	Orpiw ,seigolonhceT Erolagnab	✓

Passed all tests!

Question **3**

Given two char arrays input1[] and input2[] containing only lower case alphabets, extracts the alphabets which are present in both arrays (common alphabets).

Get the ASCII values of all the extracted alphabets.

Calculate sum of those ASCII values. Lets call it sum1 and calculate single digit sum of sum1, i.e., keep adding the digits of sum1 until you arrive at a single digit.

Return that single digit as output.

Note:

1. Array size ranges from 1 to 10.
2. All the array elements are lower case alphabets.
3. Atleast one common alphabet will be found in the arrays.

For example:

Input	Result
a b c b c	8

CODING

```
import java.util.Scanner;
public class CommonAlphabets {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      String input1 = sc.nextLine();
      String input2 = sc.nextLine();
      sc.close();
      char[] array1 = input1.replace(" ", "").toCharArray();
      char[] array2 = input2.replace(" ", "").toCharArray();
      int sum1 = 0;
      for (char c1 : array1) {
         for (char c2 : array2) {
            if (c1 == c2) {
               sum1 += (int) c1;
               break;
            }
         }
```

```
        }
        int singleDigitSum = getSingleDigitSum(sum1);
        System.out.println(singleDigitSum);
    }
    private static int getSingleDigitSum(int number) {
        while (number >= 10) {
            int sum = 0;
            while (number > 0) {
                sum += number % 10;
                number /= 10;
            }
            number = sum;
        }
        return number;
    }
}
```

Input	Expected	Got	
a b c b c	8	8	✓

Passed all tests!

EXPENSE TRACKER SYSTEM

A MINI PROJECT REPORT

Submitted by

SHIYAM(231001193)

in partial fulfilment for the course

CS23333-OBJECT ORIENTED PROGRAMMING USING JAVA

for the degree of

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in

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DEPARTMENT OF INFORMATION TECHNOLOGY

RAJALAKSMI ENGINEERING COLLEGE

ANNA UNIVERSITY, CHENNAI

NOVEMBER 2024

BONAFIDE CERTIFICATE

Certified that this project report titled "**EXPENSE TRACKER SYSTEM**" is the bonafide work of **SHIYAM (231001193)** who carried out the work under my supervision. Certified further that to the best of my knowledge the work reported herein does not form part of any other thesis or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

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Internal Examiner **External Examiner**

ABSTRACT

The Expense Tracker Application is an automated software solution designed to facilitate effective financial management for individuals and businesses. The system aims to enhance budgeting, expense tracking, and overall financial awareness, ensuring that users can monitor their financial activities with ease and precision.The primary features of the application include maintaining a comprehensive record of expenses, categorizing spending by type (such as income, groceries, entertainment, etc.), and generating detailed reports on financial performance. Users can effortlessly add, update, or remove transactions, capturing essential details such as date, category, description, and amount spent.Additionally, the application provides a user-friendly interface for visualizing financial data through charts and graphs, enabling users to identify spending trends and make informed decisions. Budgeting tools allow users to set spending limits for various categories, helping them stay within their financial goals. Alerts and reminders can be configured to notify users of upcoming bills or budget thresholds

TABLE OF CONTENTS

INTRODUCTION

1.1 INTRODUCTION

Introduction to the Expense Tracker Application
In an increasingly complex financial landscape, managing personal finances has become more crucial than ever. The Expense Tracker Application is designed to empower individuals and small businesses by providing a comprehensive tool for monitoring and managing their financial activities. This innovative application simplifies the process of tracking expenses, budgeting, and analyzing spending habits, enabling users to gain greater control over their financial well-being.

1.1 IMPLEMENTATION

The **Expense Tracker** project discussed here is implemented using the concepts of **JAVA SWING** and **MYSQL**.

1.2 SCOPE OF THE PROJECT

The Expense Tracker application enables users to manage their personal finances by adding, updating, and categorizing transactions as income or expenses through a user-friendly Java interface. It integrates with a database for efficient data storage and retrieval, facilitating monthly expense calculations and financial summaries.

1.3 WEBSITE FEATURES

- Add, update, and remove transactions.
- Categorize transactions as income or expenses.
- Calculate and display monthly income and expenses.
- User-friendly graphical interface using Java Swing.
- Database integration for secure data storage and retrieval.
- Display total balance, total income, and total expenses.
- Customizable transaction descriptions.
- Confirmation dialogs for critical actions (e.g., deletion and logout).

SYSTEM SPECIFICATIONS

2.1 HARDWARE SPECIFICATIONS:

PROCESSOR	:	Intel i7
MEMORY SIZE	:	24GB
HARD DISK	:	500 GB of free space

2.2 SOFTWARE SPECIFICATIONS:

PROGRAMMING LANGUAGE	:	Java, MySQL
FRONT-END	:	Java
BACK-END	:	MySQL
OPERATING SYSTEM	:	Windows 11

SAMPLE CODE

3.1 HOME PAGE DESIGN

```
import ExpenseTracker.src.Login;
import java.awt.*;
import java.awt.event.*;
import java.text.ParseException;
import java.text.SimpleDateFormat;
import java.util.Calendar;
import java.util.Date;
import javax.swing.*;
import javax.swing.table.DefaultTableCellRenderer;
import javax.swing.table.DefaultTableModel;
import java.sql.Connection;
import java.sql.PreparedStatement;
import java.sql.ResultSet;
import java.sql.SQLException;
import java.sql.Statement;

public ExpenseAndIncomeTrackerApp()
    { frame = new JFrame();
    frame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
    frame.setSize(800, 500);
    frame.setLocationRelativeTo(null);
    frame.setUndecorated(true);
    frame.getRootPane().setBorder(BorderFactory.createMatteBorder(5, 5, 5, 5, new Color(52, 73, 94)));

    titleBar = new JPanel(); titleBar.setLayout(null);
    titleBar.setBackground(new Color(52, 73, 94));
    titleBar.setPreferredSize(new Dimension(frame.getWidth(), 30));
    frame.add(titleBar, BorderLayout.NORTH);

    titleLabel = new JLabel("AURA-THE EXPENSE TRACKER");
    titleLabel.setForeground(Color.WHITE);
    titleLabel.setFont(new Font("Arial", Font.BOLD, 15));
    titleLabel.setBounds(10, 0, 250, 30);
    titleBar.add(titleLabel);

    closeLabel = new JLabel("x");
    closeLabel.setForeground(Color.WHITE);
    closeLabel.setFont(new Font("Arial", Font.BOLD, 17));
    closeLabel.setHorizontalAlignment(SwingConstants.CENTER);
    closeLabel.setBounds(frame.getWidth() - 50, 0, 30, 30);
    closeLabel.setCursor(new Cursor(Cursor.HAND_CURSOR));

    closeLabel.addMouseListener(new MouseAdapter()
       { @Override
       public void mouseClicked(MouseEvent e)
          { System.exit(0);
       }

       @Override
```

```
    public void mouseEntered(MouseEvent e)
        { closeLabel.setForeground(Color.red);
    }

    @Override
    public void mouseExited(MouseEvent e)
        { closeLabel.setForeground(Color.white);
    }
});

titleBar.add(closeLabel);

minimizeLabel = new JLabel("-");
minimizeLabel.setForeground(Color.WHITE);
minimizeLabel.setFont(new Font("Arial", Font.BOLD, 17));
minimizeLabel.setHorizontalAlignment(SwingConstants.CENTER);
minimizeLabel.setBounds(frame.getWidth() - 80, 0, 30, 30);
minimizeLabel.setCursor(new Cursor(Cursor.HAND_CURSOR));

minimizeLabel.addMouseListener(new MouseAdapter()
    { @Override
    public void mouseClicked(MouseEvent e)
        { frame.setState(JFrame.ICONIFIED);
    }

    @Override
    public void mouseEntered(MouseEvent e)
        { minimizeLabel.setForeground(Color.yellow);
    }

    @Override
    public void mouseExited(MouseEvent e)
        { minimizeLabel.setForeground(Color.white);
    }
});

titleBar.add(minimizeLabel);

titleBar.addMouseListener(new MouseAdapter() {
    @Override
    public void mousePressed(MouseEvent e)
        { isDragging = true;
        mouseOffset = e.getPoint();
    }

    @Override
    public void mouseReleased(MouseEvent e)
        { isDragging = false;
    }
});

titleBar.addMouseMotionListener(new MouseAdapter()
    { @Override
    public void mouseDragged(MouseEvent e) {
```

```
        if (isDragging) {
            Point newLocation = e.getLocationOnScreen();
            newLocation.translate(-mouseOffset.x, -mouseOffset.y);
            frame.setLocation(newLocation);
        }
    }
});

dashboardPanel = new JPanel();
dashboardPanel.setLayout(new FlowLayout(FlowLayout.CENTER, 20, 20));
dashboardPanel.setBackground(new Color(211, 211,        211));
frame.add(dashboardPanel, BorderLayout.CENTER);

buttonsPanel = new JPanel();
buttonsPanel.setLayout(new GridLayout(5, 1, 5, 5));

addTransactionButton = new JButton("Add Transaction");
addTransactionButton.setBackground(new Color(41, 128, 150));
addTransactionButton.setForeground(Color.WHITE);
addTransactionButton.setFocusPainted(false);
addTransactionButton.setBorderPainted(false);
addTransactionButton.setFont(new Font("Arial", Font.BOLD, 14));
addTransactionButton.setCursor(new Cursor(Cursor.HAND_CURSOR));

removeTransactionButton = new JButton("Remove Transaction");
removeTransactionButton.setBackground(new Color(231, 76, 60));
removeTransactionButton.setForeground(Color.WHITE);
removeTransactionButton.setFocusPainted(false);
removeTransactionButton.setBorderPainted(false);
removeTransactionButton.setFont(new Font("Arial", Font.BOLD, 14));
removeTransactionButton.setCursor(new Cursor(Cursor.HAND_CURSOR));

updateTransactionButton = new JButton("Update Transaction");
updateTransactionButton.setBackground(new Color(255, 192, 203)); // Pink color
updateTransactionButton.setForeground(Color.WHITE);
updateTransactionButton.setFocusPainted(false);
updateTransactionButton.setBorderPainted(false);
updateTransactionButton.setFont(new Font("Arial", Font.BOLD, 14));
updateTransactionButton.setCursor(new Cursor(Cursor.HAND_CURSOR));

calculateMonthlyButton = new JButton("Calculate Monthly Expense");
calculateMonthlyButton.setBackground(new Color(46, 204, 113));
calculateMonthlyButton.setForeground(Color.WHITE);
calculateMonthlyButton.setFocusPainted(false);
calculateMonthlyButton.setBorderPainted(false);
calculateMonthlyButton.setFont(new Font("Arial", Font.BOLD, 14));
calculateMonthlyButton.setCursor(new Cursor(Cursor.HAND_CURSOR));

logoutButton = new JButton("Logout");
logoutButton.setBackground(new Color(128, 0, 128));
logoutButton.setForeground(Color.WHITE);
logoutButton.setFocusPainted(false);
logoutButton.setBorderPainted(true);
logoutButton.setBorder(BorderFactory.createLineBorder(Color.white,   2));
```

```
    thickness
    logoutButton.setFont(new Font("Arial", Font.BOLD, 14));
    logoutButton.setCursor(new Cursor(Cursor.HAND_CURSOR));
```

3.2 LOGIN PAGE DESIGN:

```
package login_page;

import javax.swing.*;  import
java.awt.*;
import    java.awt.event.ActionEvent;    import
java.awt.event.ActionListener;
import login_page_back_end.loginPageBE;

public class Login {
   private JFrame loginFrame;
   private JTextField usernameField;
   private JPasswordField passwordField;
   private final String CORRECT_USERNAME = "system"; // Predefined username
   private final String CORRECT_PASSWORD = "rec"; // Predefined password

   public Login() {
      // Create and set up the login window
      loginFrame = new JFrame("AURA - Login");
      loginFrame.setSize(400, 300);
      loginFrame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
      loginFrame.setLocationRelativeTo(null);
      loginFrame.setUndecorated(true); // Remove window decorations
      loginFrame.getRootPane().setBorder(BorderFactory.createMatteBorder(2, 2, 2, 2, new Color(52, 73, 94)));

      // Create main panel with a nice background color
      JPanel mainPanel = new JPanel();
      mainPanel.setLayout(null);
      mainPanel.setBackground(new Color(211, 211, 211));

      // Create title label
      JLabel titleLabel = new JLabel("AURA EXPENSE TRACKER");
      titleLabel.setFont(new Font("Arial", Font.BOLD, 16));
      titleLabel.setBounds(90, 30, 250, 30);
      titleLabel.setForeground(new Color(52, 73, 94));

      // Create username label and field
      JLabel usernameLabel = new JLabel("Username:");
      usernameLabel.setBounds(50, 90, 80, 25);
      usernameField = new JTextField();
      usernameField.setBounds(140, 90, 200, 25);
```

```
// Create password label and field
JLabel passwordLabel = new JLabel("Password:");
passwordLabel.setBounds(50, 130, 80, 25);
passwordField = new JPasswordField();
passwordField.setBounds(140, 130, 200, 25);

// Create login button
JButton loginButton = new JButton("Login");
loginButton.setBounds(140, 180, 100, 30);
loginButton.setBackground(new Color(41, 128, 185));
loginButton.setForeground(Color.WHITE);
loginButton.setFocusPainted(false);
loginButton.setBorderPainted(false);
loginButton.setCursor(new Cursor(Cursor.HAND_CURSOR));

// Create exit button
JButton exitButton = new JButton("Exit");
exitButton.setBounds(250, 180, 90, 30);
exitButton.setBackground(new Color(231, 80, 60));
exitButton.setForeground(Color.WHITE);
exitButton.setFocusPainted(false);
exitButton.setBorderPainted(false);
exitButton.setCursor(new Cursor(Cursor.HAND_CURSOR));

// Add action listener to login button
loginButton.addActionListener(new ActionListener() {
   @Override
   public void actionPerformed(ActionEvent e)
      { String username =
      usernameField.getText();
      String password = new String(passwordField.getPassword());

      if (username.equals(CORRECT_USERNAME) && password.equals(CORRECT_PASSWORD))
         { loginFrame.dispose(); // Close login window
         // Start the main application
         SwingUtilities.invokeLater(new Runnable() {
            @Override
            public void run() {
               new ExpenseAndIncomeTrackerApp();
            }
         });
      } else {
         JOptionPane.showMessageDialog(loginFrame,
               "Invalid username or password!",
               "Login Error",
               JOptionPane.ERROR_MESSAGE);
         // Clear the password field
```

```
passwordField.setText("");
```

```
            }
        }
    });

    // Add action listener to exit button
    exitButton.addActionListener(new ActionListener() {
        @Override
        public void actionPerformed(ActionEvent e)
            { System.exit(0);
        }
    });

    // Add components to the panel
    mainPanel.add(titleLabel);
    mainPanel.add(usernameLabel);
    mainPanel.add(usernameField);
    mainPanel.add(passwordLabel);
    mainPanel.add(passwordField);
    mainPanel.add(loginButton);
    mainPanel.add(exitButton);

    // Add panel to frame
    loginFrame.add(mainPanel);
    loginFrame.setVisible(true);
}
```

3.3 DASHBOARD DESIGN

```
dashboardPanel = new JPanel();
    dashboardPanel.setLayout(new FlowLayout(FlowLayout.CENTER, 20, 20));
    dashboardPanel.setBackground(new Color(211, 211,    211));
    frame.add(dashboardPanel, BorderLayout.CENTER);

    // Create and set up buttons panel
    buttonsPanel = new JPanel();
    buttonsPanel.setLayout(new GridLayout(5, 1, 5, 5)); // Change to 5 rows to accommodate the new button

    addTransactionButton = new JButton("Add Transaction");
    addTransactionButton.setBackground(new Color(41, 128, 150));
    addTransactionButton.setForeground(Color.WHITE);
    addTransactionButton.setFocusPainted(false);
    addTransactionButton.setBorderPainted(false);
    addTransactionButton.setFont(new Font("Arial", Font.BOLD, 14));
    addTransactionButton.setCursor(new Cursor(Cursor.HAND_CURSOR));

    removeTransactionButton = new JButton("Remove Transaction");
    removeTransactionButton.setBackground(new Color(231, 76, 60));
    removeTransactionButton.setForeground(Color.WHITE);
    removeTransactionButton.setFocusPainted(false);
    removeTransactionButton.setBorderPainted(false);
    removeTransactionButton.setFont(new Font("Arial", Font.BOLD, 14));
```

```
        removeTransactionButton.setCursor(new Cursor(Cursor.HAND_CURSOR));

        // Create the Update Transaction button
        updateTransactionButton = new JButton("Update Transaction");
        updateTransactionButton.setBackground(new Color(255, 192, 203)); // Pink color
        updateTransactionButton.setForeground(Color.WHITE);
        updateTransactionButton.setFocusPainted(false);
        updateTransactionButton.setBorderPainted(false);
        updateTransactionButton.setFont(new Font("Arial", Font.BOLD, 14));
        updateTransactionButton.setCursor(new Cursor(Cursor.HAND_CURSOR));

        calculateMonthlyButton = new JButton("Calculate Monthly Expense");
        calculateMonthlyButton.setBackground(new Color(46, 204, 113));
        calculateMonthlyButton.setForeground(Color.WHITE);
        calculateMonthlyButton.setFocusPainted(false);
        calculateMonthlyButton.setBorderPainted(false);
        calculateMonthlyButton.setFont(new Font("Arial", Font.BOLD, 14));
        calculateMonthlyButton.setCursor(new Cursor(Cursor.HAND_CURSOR));

        logoutButton = new JButton("Logout");
        logoutButton.setBackground(new Color(128, 0, 128)); // Purple
        logoutButton.setForeground(Color.WHITE); // White text
        logoutButton.setFocusPainted(false);
        logoutButton.setBorderPainted(true); // Enable border painting
        logoutButton.setBorder(BorderFactory.createLineBorder(Color.white, 2)); // Set border color and
thickness
        logoutButton.setFont(new Font("Arial", Font.BOLD, 14));
        logoutButton.setCursor(new Cursor(Cursor.HAND_CURSOR));

        // Add buttons to the panel
        buttonsPanel.add(addTransactionButton);
        buttonsPanel.add(removeTransactionButton);
        buttonsPanel.add(updateTransactionButton); // Add Update button here
        buttonsPanel.add(calculateMonthlyButton);
        buttonsPanel.add(logoutButton);
        dashboardPanel.add(buttonsPanel);
        String[] columnNames = {"ID", "Date", "Type", "Description", "Amount"};
        tableModel = new DefaultTableModel(columnNames, 0) {
            @Override
            public boolean isCellEditable(int row, int column)
                { return false;
            }
        };

        // Create the transaction table
        transactionTable = new JTable(tableModel);
        transactionTable.setBackground(Color.WHITE);
        transactionTable.setGridColor(new Color(200, 200, 200));
        transactionTable.setRowHeight(25);
        transactionTable.getTableHeader().setBackground(new Color(52, 73, 94));
        transactionTable.getTableHeader().setForeground(Color.WHITE);
        transactionTable.getTableHeader().setFont(new Font("Arial", Font.BOLD, 12));

        // Add custom cell renderer for coloring based on type
```

```
    transactionTable.setDefaultRenderer(Object.class, new DefaultTableCellRenderer()
        { @Override
        public Component getTableCellRendererComponent(JTable table, Object value,
                boolean isSelected, boolean hasFocus, int row, int column) {
            Component c = super.getTableCellRendererComponent(table, value, isSelected, hasFocus, row,
column);

            String type = (String) table.getModel().getValueAt(row, 2); // Column 2 contains the type

            if (type.equals("Expense")) {
                c.setForeground(new Color(231, 76, 60)); // Red color for expense
            } else if (type.equals("Income")) {
                c.setForeground(new Color(46, 204, 113)); // Green color for income
            } else {
                c.setForeground(Color.BLACK); // Default color
            }

            // Maintain selection highlighting
            if (isSelected) {
                c.setBackground(table.getSelectionBackground());
            } else {
                c.setBackground(table.getBackground());
            }

            return c;
        }
    });

    // Create scroll pane for the table
    JScrollPane scrollPane = new JScrollPane(transactionTable);
    scrollPane.setPreferredSize(new Dimension(500, 300));
    dashboardPanel.add(scrollPane);

    // Create total amount panel
    JPanel totalPanel = new JPanel();
    totalPanel.setLayout(new GridLayout(3, 1)); // Change to GridLayout with 3 rows
    totalPanel.setBackground(new Color(211, 211, 211));

    // Total Balance Label
    totalLabel = new JLabel("Total Balance: ₹" + String.format("%.2f", totalAmount));
    totalLabel.setFont(new Font("Arial", Font.BOLD, 16));
    totalLabel.setForeground(new Color(52, 73, 94));
    totalPanel.add(totalLabel);

    // Total Income Label
    incomeLabel = new JLabel("Total Income: ₹0.00");
    incomeLabel.setFont(new Font("Arial", Font.BOLD, 16));
    incomeLabel.setForeground(new Color(46, 204, 113)); // Green color for income
    totalPanel.add(incomeLabel);

    // Total Expense Label
    expenseLabel = new JLabel("Total Expense: ₹0.00");
    expenseLabel.setFont(new Font("Arial", Font.BOLD, 16));
    expenseLabel.setForeground(new Color(231, 76, 60)); // Red color for expense
```

```
    totalPanel.add(expenseLabel);

    dashboardPanel.add(totalPanel);

    // Add action listeners for buttons
    addTransactionButton.addActionListener(new ActionListener() {
        @Override
        public void actionPerformed(ActionEvent e)
            { showAddTransactionDialog();
        }
    });
    updateTransactionButton.addActionListener(new ActionListener()
        { @Override
        public void actionPerformed(ActionEvent e)
            { showUpdateTransactionDialog();
        }
    });

    calculateMonthlyButton.addActionListener(new ActionListener()
        { @Override
        public void actionPerformed(ActionEvent e)
            { showMonthlyExpenseDialog();
        }
    });

    removeTransactionButton.addActionListener(new ActionListener()
        { @Override
        public void actionPerformed(ActionEvent e)
            { removeSelectedTransaction();
        }
    });

    logoutButton.addActionListener(new ActionListener()
        { @Override
        public void actionPerformed(ActionEvent e) {
            int choice = JOptionPane.showConfirmDialog(frame,
                    "Are you sure you want to logout?",
                    "Logout Confirmation",
                    JOptionPane.YES_NO_OPTION);

            if (choice == JOptionPane.YES_OPTION)
                { frame.dispose(); // Close the current window
                new Login(); // Open the Login window
            }
        }
    });

    // Make the frame visible
    frame.setVisible(true);
}
```

3.4 REMOVE OPERATION IN DASHBOARD

```
package remove_student;

import dash_board.dashBoard; import
table_order.tableOrder;

import java.awt.*;
import java.awt.event.ActionEvent; import
java.awt.event.ActionListener; import
java.sql.Connection;
import java.sql.DriverManager; import
java.sql.PreparedStatement;

import javax.swing.*;
private void removeSelectedTransaction() {
    int selectedRow = transactionTable.getSelectedRow();
    if (selectedRow != -1) {
        // Confirm deletion
        int choice = JOptionPane.showConfirmDialog(frame,
                "Are you sure you want to delete this transaction?",
                "Confirm Deletion",
                JOptionPane.YES_NO_OPTION);

        if (choice != JOptionPane.YES_OPTION)
            { return; // User chose not to delete
        }

        // Get the transaction details
        int transactionId = (int) tableModel.getValueAt(selectedRow, 0); // Assuming ID is in column 0
        String type = (String) tableModel.getValueAt(selectedRow, 2); // Assuming Type is in column 2
        String description = (String) tableModel.getValueAt(selectedRow, 3); // Assuming Description is in
        column 3
        double amount = Double.parseDouble((String) tableModel.getValueAt(selectedRow, 4)); // Assuming
        Amount is in column 4

        // Remove from the main transaction table
        try (Connection connection = DataBaseConnector.getConnection();
            PreparedStatement psMain = connection.prepareStatement(
                    "DELETE FROM transaction_table WHERE ID = ?"))
            { psMain.setInt(1, transactionId);
            psMain.executeUpdate();
            System.out.println("Transaction removed successfully from the main table.");
        } catch (SQLException e) {
            JOptionPane.showMessageDialog(frame, "Error removing transaction from main table: " +
e.getMessage(),
                    "Database Error", JOptionPane.ERROR_MESSAGE);
            return;
        }

        // Remove from the category-specific table
        String categoryTableName = description.toLowerCase() + "_transactions"; // Construct table name
        try (Connection connection = DataBaseConnector.getConnection();
            PreparedStatement psCategory = connection.prepareStatement(
```

```
                "DELETE FROM " + categoryTableName + " WHERE ID = ?"))
            { psCategory.setInt(1, transactionId); // Use the same ID
            int rowsAffected = psCategory.executeUpdate();
            if (rowsAffected > 0) {
                System.out.println("Transaction removed successfully from " + categoryTableName);
            } else {
                JOptionPane.showMessageDialog(frame, "No transaction found in " + categoryTableName + "
            with ID: " + transactionId,
                        "Deletion Warning", JOptionPane.WARNING_MESSAGE);
            }
        } catch (SQLException e) {
            JOptionPane.showMessageDialog(frame, "Error removing transaction from category table: " +
          e.getMessage(),
                    "Database Error", JOptionPane.ERROR_MESSAGE);
            return;
        }

        // Update the total amount based on transaction type
        if (type.equals("Income")) {
            totalAmount -= amount; // Subtract income amount from total
            double currentIncome = Double.parseDouble(incomeLabel.getText().replace("Total Income: ₹",
          ""));
            currentIncome -= amount; // Subtract from total income
            incomeLabel.setText("Total Income: ₹" + String.format("%.2f", currentIncome));
        } else { // Expense
            totalAmount += amount; // Add expense amount back to total
            double currentExpense = Double.parseDouble(expenseLabel.getText().replace("Total Expense: ₹",
          ""));
            currentExpense -= amount; // Subtract from total expense
            expenseLabel.setText("Total Expense: ₹" + String.format("%.2f", currentExpense));
        }

        // Update the total balance label
        totalLabel.setText("Total Balance: ₹" + String.format("%.2f", totalAmount));

        // Remove the row from the table
        tableModel.removeRow(selectedRow);

        // Inform the user that the transaction was successfully removed
        JOptionPane.showMessageDialog(frame, "Transaction successfully removed.", "Success",
        JOptionPane.INFORMATION_MESSAGE);
    } else {
        JOptionPane.showMessageDialog(frame, "Please select a transaction to remove!",
            "No Selection", JOptionPane.WARNING_MESSAGE);
    }
}
private void showAddTransactionDialog() {
    JDialog dialog = new JDialog(frame, "Add Transaction", true);
    dialog.setLayout(new GridLayout(5, 2, 10, 10));
    dialog.setSize(400, 250);
    dialog.setLocationRelativeTo(frame);

    String[] types = {"Expense", "Income"};
    JComboBox<String> typeCombo = new JComboBox<>(types);
```

```
// JComboBox for predefined descriptions
String[] descriptions = {"Medical", "Shopping", "Entertainment", "Transport", "Grocery", "Others"};
JComboBox<String> descriptionCombo = new JComboBox<>(descriptions);

JTextField amountField = new JTextField();

// Create date spinners
Calendar now = Calendar.getInstance();
JSpinner yearSpinner = new JSpinner(new SpinnerNumberModel(now.get(Calendar.YEAR), 1900, 2100,
1));
JSpinner monthSpinner = new JSpinner(new SpinnerNumberModel(now.get(Calendar.MONTH) + 1, 1,
12, 1));
JSpinner daySpinner = new JSpinner(new SpinnerNumberModel(now.get(Calendar.DAY_OF_MONTH),
  1, 31, 1));

JSpinner.NumberEditor yearEditor = new JSpinner.NumberEditor(yearSpinner, "#");
yearSpinner.setEditor(yearEditor);

Dimension spinnerSize = new Dimension(60, 25);
yearSpinner.setPreferredSize(spinnerSize);
monthSpinner.setPreferredSize(new Dimension(45, 25));
daySpinner.setPreferredSize(new Dimension(45, 25));

JPanel datePanel = new JPanel();
datePanel.add(yearSpinner);
datePanel.add(new JLabel("-"));
datePanel.add(monthSpinner);
datePanel.add(new JLabel("-"));
datePanel.add(daySpinner);

JButton submitButton = new JButton("Add");

dialog.add(new JLabel("Date:"));
dialog.add(datePanel);
dialog.add(new JLabel("Type:"));
dialog.add(typeCombo);
dialog.add(new JLabel("Description:"));
dialog.add(descriptionCombo);
dialog.add(new JLabel("Amount:"));
dialog.add(amountField);
dialog.add(new JLabel(""));
dialog.add(submitButton);

submitButton.addActionListener(new ActionListener()
   { @Override
   public void actionPerformed(ActionEvent e)
      { try {
         // Validate amount input
         if (amountField.getText().trim().isEmpty())
            { JOptionPane.showMessageDialog(dialog, "Please enter an amount!");
            return;
         }

         double amount = Double.parseDouble(amountField.getText());
```

```
// Validate description selection
String description = (String) descriptionCombo.getSelectedItem();
if (description == null || description.trim().isEmpty()) {
    JOptionPane.showMessageDialog(dialog, "Please select a description!");
    return;
}

// Get selected date
Calendar calendar = Calendar.getInstance();
calendar.set(Calendar.YEAR, (Integer) yearSpinner.getValue());
calendar.set(Calendar.MONTH, (Integer) monthSpinner.getValue() - 1);
calendar.set(Calendar.DAY_OF_MONTH, (Integer) daySpinner.getValue());
Date selectedDate = calendar.getTime();

// Get transaction type
String type = (String) typeCombo.getSelectedItem();

// Update totals based on transaction type
if (type.equals("Income")) {
    totalAmount += amount;
    double currentIncome = Double.parseDouble(incomeLabel.getText().replace("Total Income:
    ₹", ""));
    currentIncome += amount;
    incomeLabel.setText("Total Income: ₹" + String.format("%.2f", currentIncome));
} else { // Expense
    totalAmount -= amount;
    double currentExpense = Double.parseDouble(expenseLabel.getText().replace("Total Expense:
    ₹", ""));
    currentExpense += amount;
    expenseLabel.setText("Total Expense: ₹" + String.format("%.2f", currentExpense));
}

totalLabel.setText("Total Balance: ₹" + String.format("%.2f", totalAmount));

SimpleDateFormat dateFormat = new SimpleDateFormat("yyyy-MM-dd");
String dateString = dateFormat.format(selectedDate);

// Store expenses as negative values
if (type.equals("Expense")) {
    amount = -amount; // Store expenses as negative values in the database
}

// Add to database and get the new ID
int newId = addTransaction(typeCombo, descriptionCombo, amountField, yearSpinner,
monthSpinner, daySpinner);

// Check if the transaction was added successfully
if (newId != -1) {
    tableModel.addRow(new Object[]{newId, dateString, type, description, String.format("%.2f",
Math.abs(amount))}); // Use absolute value for display
} else {
    JOptionPane.showMessageDialog(dialog, "Failed to add transaction.",
        "Error", JOptionPane.ERROR_MESSAGE);
}
```

```
                dialog.dispose(); // Close the dialog after processing
            } catch (NumberFormatException ex)
                { JOptionPane.showMessageDialog(dialog, "Please enter a valid amount!",
                    "Error", JOptionPane.ERROR_MESSAGE);
            } catch (Exception ex) {
                // Catch any other exceptions that might occur
                ex.printStackTrace();
                JOptionPane.showMessageDialog(dialog, "An unexpected error occurred: " + ex.getMessage(),
                    "Error", JOptionPane.ERROR_MESSAGE);
            }
        }
    });

    dialog.getRootPane().registerKeyboardAction(
        e -> dialog.dispose(),
        KeyStroke.getKeyStroke(KeyEvent.VK_ESCAPE, 0),
        JComponent.WHEN_IN_FOCUSED_WINDOW
    );

    dialog.setVisible(true);
  }
```

3.5 UPDATE DATA OPERATION IN DASHBOARD

```
package update_data;

import dash_board.dashBoard; import

javax.swing.*;
import java.awt.*;
import java.awt.event.ActionEvent;

private void showUpdateTransactionDialog() {
    int selectedRow = transactionTable.getSelectedRow();
    if (selectedRow == -1) {
        JOptionPane.showMessageDialog(frame, "Please select a transaction to update!",
                "No Selection", JOptionPane.WARNING_MESSAGE);
        return;
    }

    // Retrieve current transaction details
    int transactionId = (int) tableModel.getValueAt(selectedRow, 0); // Assuming ID is in column 0
    String currentDate = (String) tableModel.getValueAt(selectedRow, 1); // Assuming Date is in column 1
    String currentType = (String) tableModel.getValueAt(selectedRow, 2); // Assuming Type is in column 2
    String currentDescription = (String) tableModel.getValueAt(selectedRow, 3); // Assuming Description is in
column 3
    double currentAmount = Double.parseDouble((String) tableModel.getValueAt(selectedRow, 4)); //
Assuming Amount is in column 4

    JDialog dialog = new JDialog(frame, "Update Transaction", true);
    dialog.setLayout(new GridLayout(5, 2, 10, 10));
```

```
        dialog.setSize(400, 250);
        dialog.setLocationRelativeTo(frame);

        // Fields for updating transaction
        JTextField dateField = new JTextField(currentDate);
        JComboBox<String> typeCombo = new JComboBox<>(new String[]{"Expense", "Income"});
        typeCombo.setSelectedItem(currentType);
        String[] descriptions = {"Medical", "Shopping", "Entertainment", "Transport", "Grocery", "Others"};
        JComboBox<String> descriptionCombo = new JComboBox<>(descriptions);
        JTextField amountField = new JTextField(String.valueOf(currentAmount));

        dialog.add(new JLabel("Date:"));
        dialog.add(dateField);
        dialog.add(new JLabel("Type:"));
        dialog.add(typeCombo);
        dialog.add(new JLabel("Description:"));
        dialog.add(descriptionCombo);
        dialog.add(new JLabel("Amount:"));
        dialog.add(amountField);

        JButton updateButton = new JButton("Update");
        dialog.add(new JLabel(""));
        dialog.add(updateButton);

        updateButton.addActionListener(new ActionListener()
           { @Override
           public void actionPerformed(ActionEvent e)
              { try {
                 String date = dateField.getText().trim();
                 String type = (String) typeCombo.getSelectedItem();
                 String description = (String) descriptionCombo.getSelectedItem();
                 double amount = Double.parseDouble(amountField.getText().trim());

                 // Create a Transaction object to update
                 Transaction transaction = new Transaction(transactionId, date, type, description, amount);
                 TransactionDAO transactionDAO = new TransactionDAO();
                 transactionDAO.updateTransaction(transaction); // Update in the database

                 // Update the table model
                 updateTableModel(transaction);

                 // Update total income, total expense, and total balance
                 updateTotals(transaction, currentAmount, type);

                 dialog.dispose(); // Close the dialog
                 JOptionPane.showMessageDialog(frame, "Transaction updated successfully.", "Success",
JOptionPane.INFORMATION_MESSAGE);
              } catch (NumberFormatException ex) {
                 JOptionPane.showMessageDialog(dialog, "Please enter a valid amount!", "Error",
JOptionPane.ERROR_MESSAGE);
              }
           }
        });

        dialog.setVisible(true);
```

```
    }


    private void showMonthlyExpenseDialog() {
        JDialog dialog = new JDialog(frame, "Calculate Monthly Summary", true);
        dialog.setLayout(new GridLayout(3, 2, 10, 10));
        dialog.setSize(300, 150);
        dialog.setLocationRelativeTo(frame);

        JComboBox<String> monthCombo = new JComboBox<>(new
            String[]{ "January", "February", "March", "April", "May", "June",
            "July", "August", "September", "October", "November", "December"
        });
        JTextField yearField = new JTextField();
        JButton calculateButton = new JButton("Calculate");

        dialog.add(new JLabel("Month:"));
        dialog.add(monthCombo);
        dialog.add(new JLabel("Year:"));
        dialog.add(yearField);
        dialog.add(new JLabel(""));
        dialog.add(calculateButton);

        calculateButton.addActionListener(new ActionListener()
            { @Override
            public void actionPerformed(ActionEvent e)
                { try {
                    int month = monthCombo.getSelectedIndex() + 1; // January is 0, so add 1
                    int year = Integer.parseInt(yearField.getText());

                    double monthlyExpense = calculateMonthlyExpense(month, year);
                    double monthlyIncome = calculateMonthlyIncome(month, year);
                    double netAmount = monthlyIncome - monthlyExpense;

                    String message = String.format("Monthly Summary for %s %d:\n\n" +
                                                   "Total Income: ₹%.2f\n" +
                                                   "Total Expense: ₹%.2f\n" +
                                                   "Net Amount: ₹%.2f",
                                                   monthCombo.getSelectedItem(), year,
                                                   monthlyIncome, monthlyExpense, netAmount);

                    JOptionPane.showMessageDialog(dialog, message, "Monthly Summary",
JOptionPane.INFORMATION_MESSAGE);
                    dialog.dispose();
                } catch (NumberFormatException ex)
                    { JOptionPane.showMessageDialog(dialog, "Please enter a valid year!",
                        "Error", JOptionPane.ERROR_MESSAGE);
                }
            }
        });

        dialog.setVisible(true);
    }
```

3.6 DATABASE MANAGEMENT

```
package ExpenseTracker;

import java.sql.Connection;
import java.sql.DriverManager;
import java.sql.SQLException;

public class DataBaseConnector {
    private static final String DB_NAME = "expense_income_db";
    private static final String JDBC_URL = "jdbc:mysql://localhost:3306/" + DB_NAME;
    private static final String USER = "root";
    private static final String PASSWORD = "";

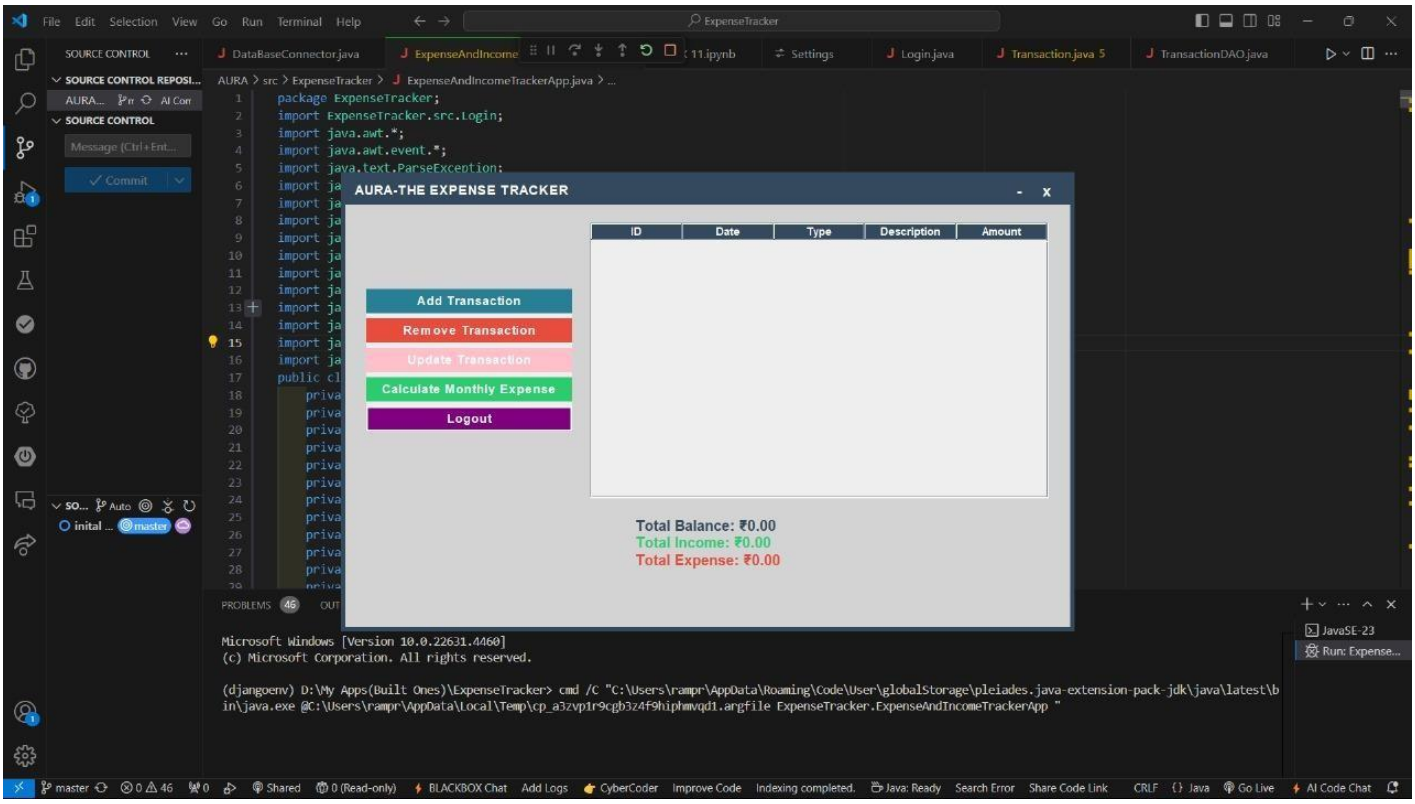
    public static Connection getConnection()
        { Connection connection = null;

        try {
            Class.forName("com.mysql.cj.jdbc.Driver");
            connection = DriverManager.getConnection(JDBC_URL, USER, PASSWORD);
            System.out.println("Connected to the database");
        } catch (ClassNotFoundException | SQLException ex)
            { System.out.println("Connection - ClassNotFoundException: " + ex.getMessage());
        }

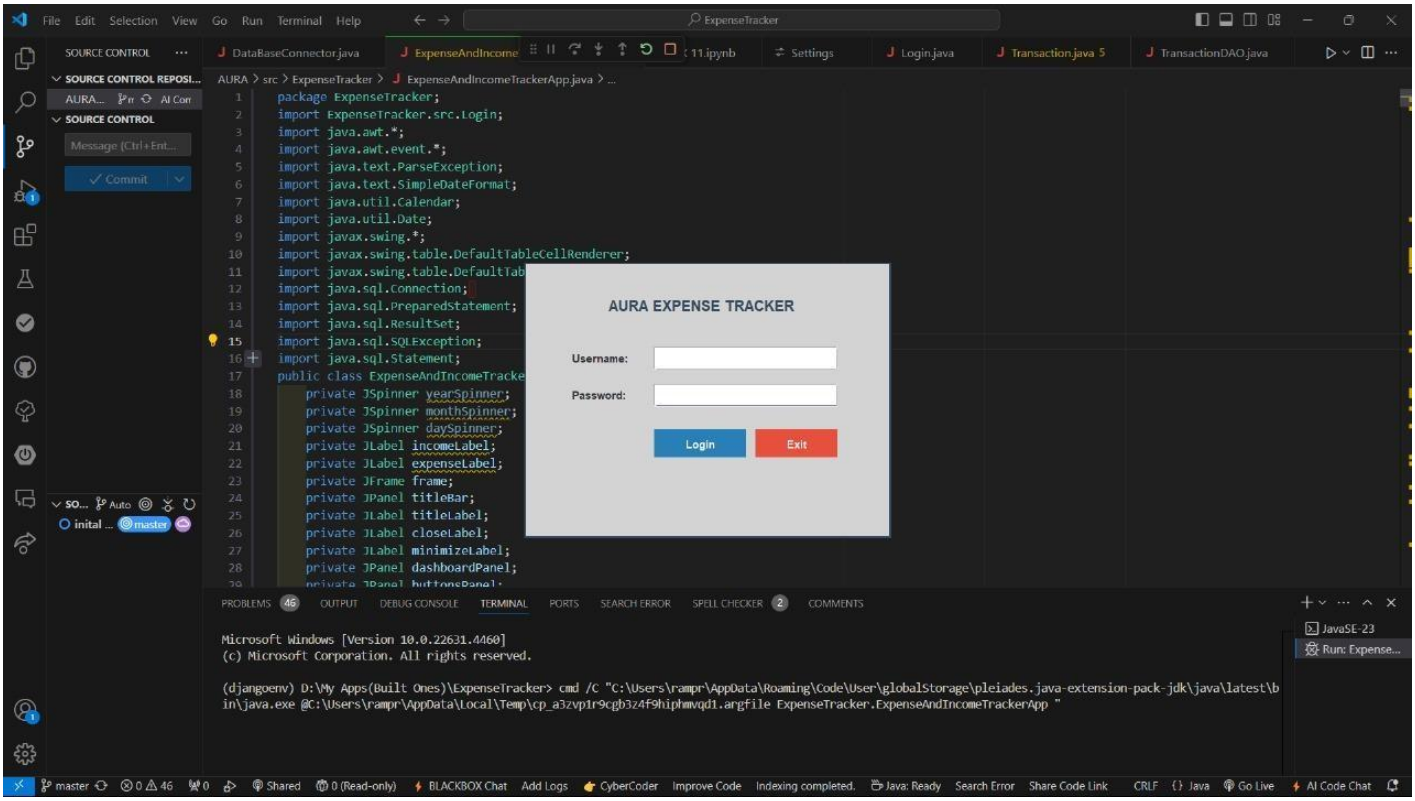
        return connection;
    }
}
```

SNAPSHOTS

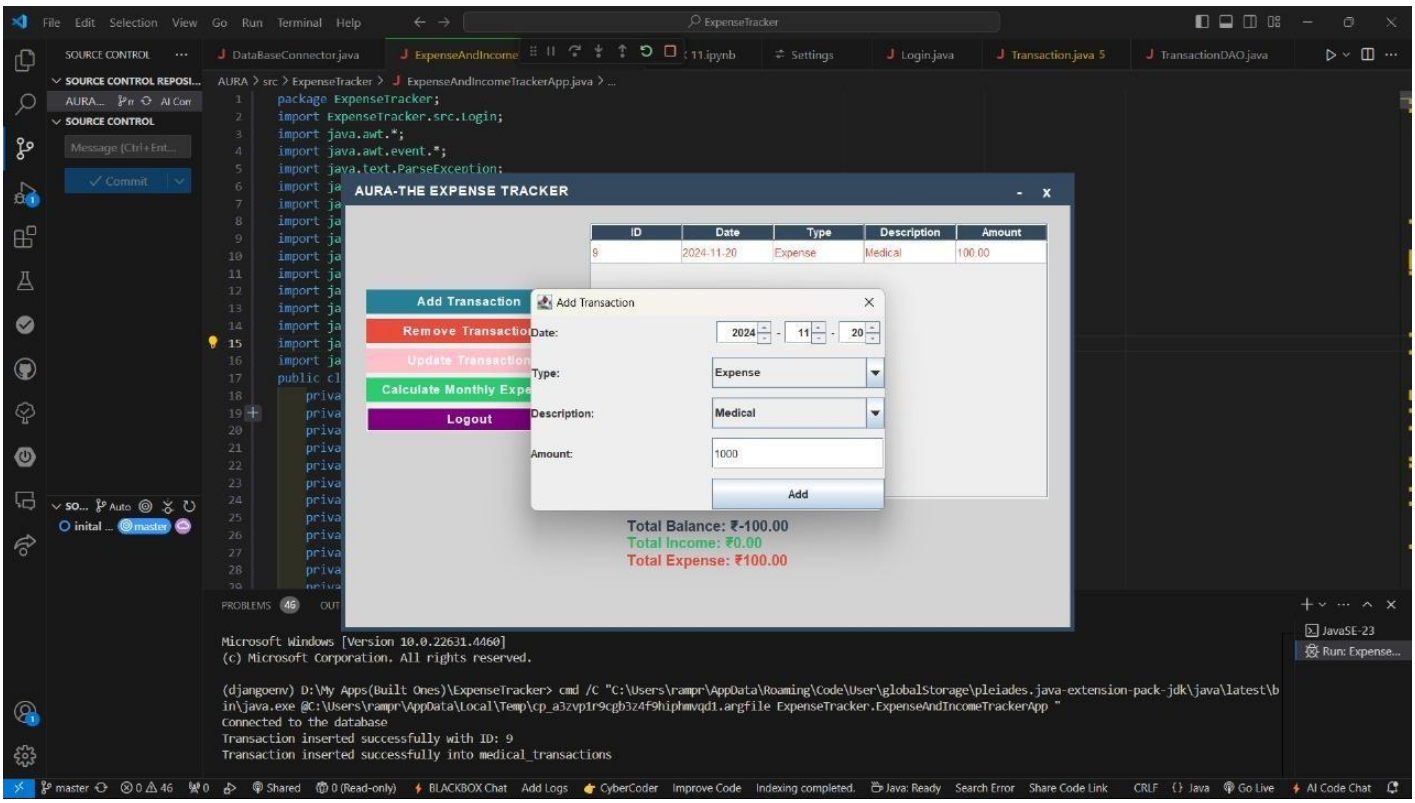
4.1 HOME PAGE



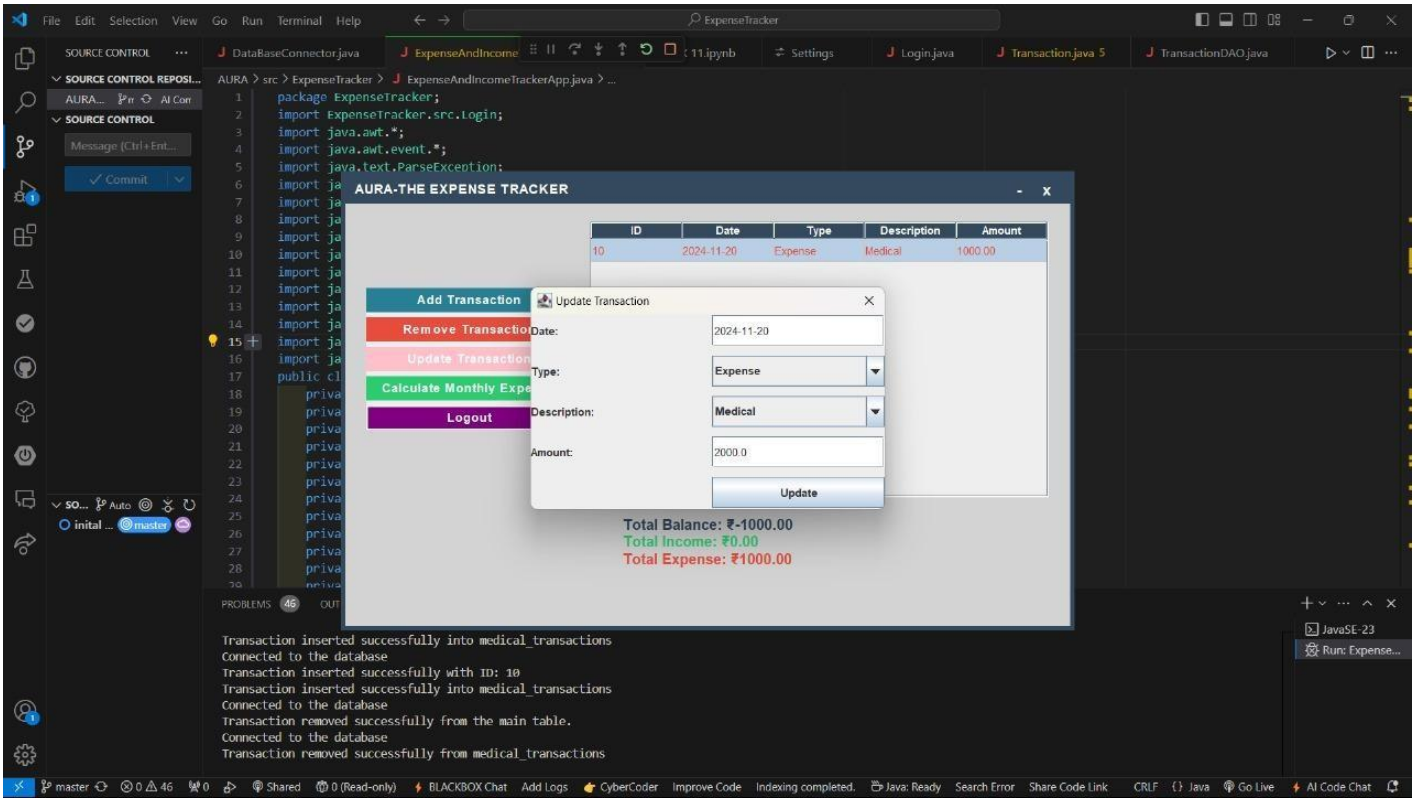
4.2 LOGIN PAGE



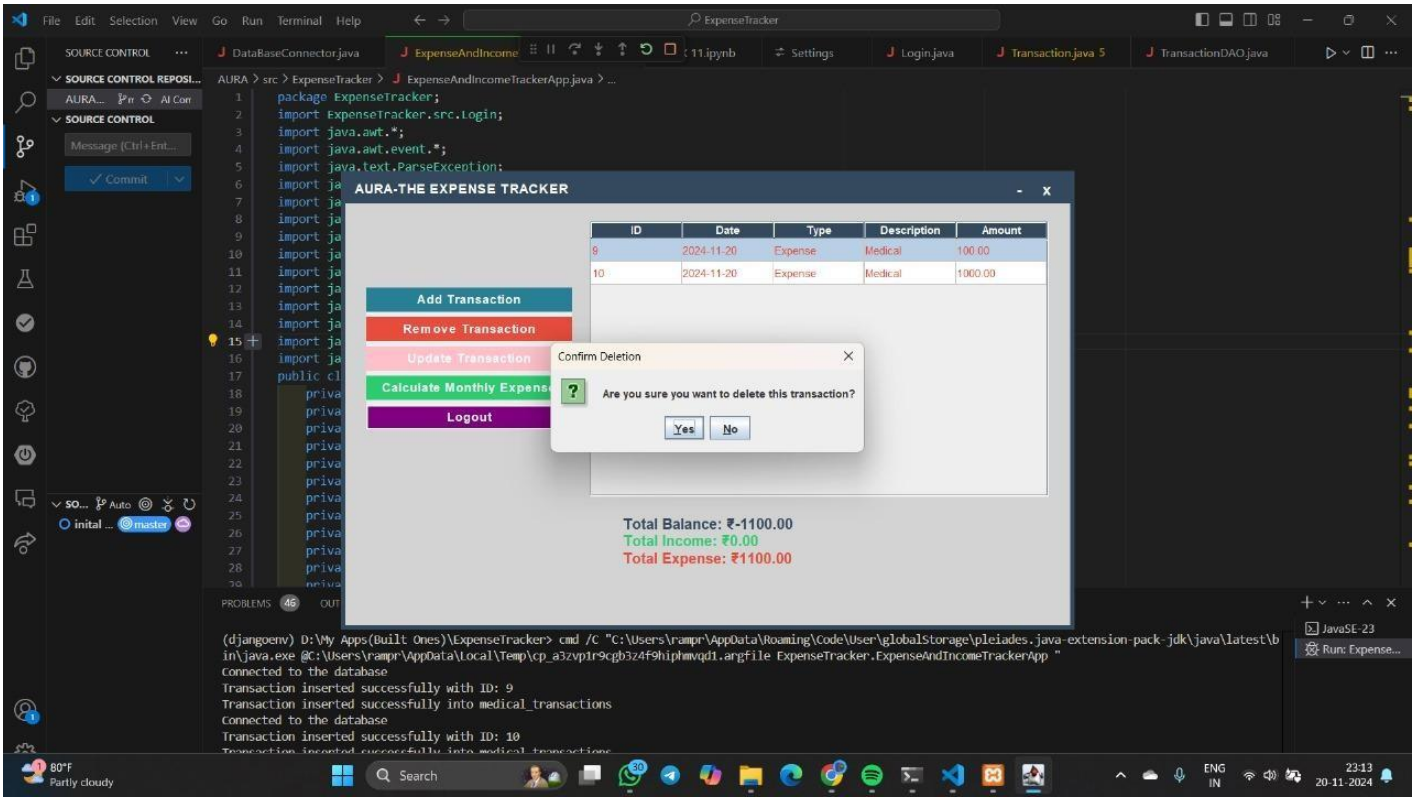
4.3 ADD TRANSACTION



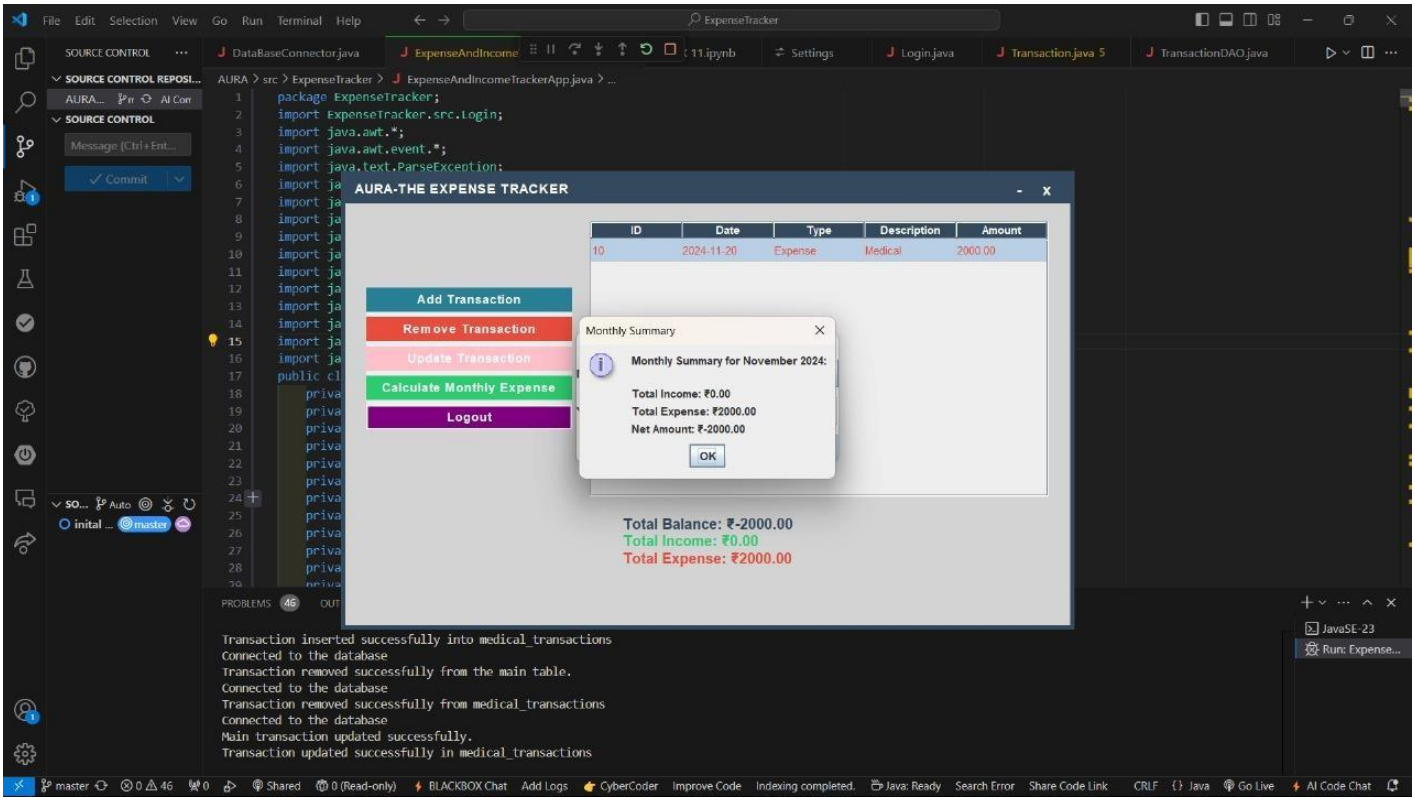
4.4 UPDATE TRANSACTION



4.4 REMOVE TRANSACTION



4.5 CALCULATE MONTHLY EXPENSE



CONCLUSION

Upon completion of the Expense Tracker application, we are confident that the issues present in manual expense tracking systems have been effectively addressed. The "EXPENSE TRACKER" application has been designed to automate the process of managing personal finances, thereby reducing human errors and enhancing overall efficiency. The primary focus of this project is to simplify the tracking of expenses and incomes, allowing users to manage their finances with minimal effort.

All transaction records are securely stored in a database, enabling quick and easy retrieval of data. Users can navigate through their financial records seamlessly, with intuitive controls provided throughout the application. For instances where users have a large number of transactions, the application features a search functionality that allows them to quickly find specific records by entering relevant search terms, delivering results almost instantaneously.

Editing transactions has also been streamlined, as users can easily modify any required fields and update their entries with a simple click of a button. Each transaction is assigned a unique identifier, ensuring accurate access and management of financial records without the risk of confusion or error.
The main aim of this project is to empower users with the tools they need to maintain accurate financial records, analyze their spending habits, and make informed decisions regarding their finances. The Expense Tracker application stands as a comprehensive solution for individuals seeking to take control of their financial well-being.

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