

VISVESVARAYA TECHNOLOGICAL UNIVERSITY

“JnanaSangama”, Belgaum -590014, Karnataka.



LAB REPORT On

OBJECT ORIENTED JAVA

Submitted by

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**in partial fulfillment for the award of the degree of
BACHELOR OF ENGINEERING
in
COMPUTER SCIENCE AND ENGINEERING**



B.M.S. COLLEGE OF ENGINEERING
(Autonomous Institution under VTU)
BENGALURU-560019
Dec 2023- March 2024

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Bull Temple Road, Bangalore 560019
(Affiliated To Visvesvaraya Technological University, Belgaum)
Department of Computer Science and Engineering



This is to certify that the Lab work entitled “**OBJECT ORIENTED PROGRAMMING**” carried out by SUFIAN(**1BM22CS292**), who is bonafide student of **B. M. S. College of Engineering**. It is in partial fulfillment for the award of **Bachelor of Engineering in Computer Science and Engineering** of the Visvesvaraya Technological University, Belgaum during the year 2023-24. The Lab report has been approved as it satisfies the academic requirements in respect of **OBJECT ORIENTED JAVA Lab - (23CS3PCOOJ)**work prescribed for the said degree.

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Course outcomes:

CO1	Apply the concept of linear and nonlinear data structures.
CO2	Analyze data structure operations for a given problem
CO3	Design and develop solutions using the operations of linear and nonlinear data structure for a given specification.
CO4	Conduct practical experiments for demonstrating the operations of different data structures.

```

public class Overloading {
    static void print(int n) {
        int sum = 0;
        for (int i = 1; i <= n; i++) {
            sum += i;
        }
        System.out.println("Sum of first " + n + " natural numbers: " + sum);
    }

    static void print(int start, int end) {
        System.out.println("Prime numbers in the range " + start + " to " + end + ":");
        for (int num = start; num <= end; num++) {
            if (isPrime(num)) {
                System.out.print(num + " ");
            }
        }
        System.out.println();
    }

    private static boolean isPrime(int num) {
        if (num <= 1) {
            return false;
        }
        for (int i = 2; i <= Math.sqrt(num); i++) {
            if (num % i == 0) {
                return false;
            }
        }
    }
}

```

```

    }

    return true;
}

```

```

public static void main(String[] args) {

```

```

    print(5);

```

```

    print(10, 30);

```

```

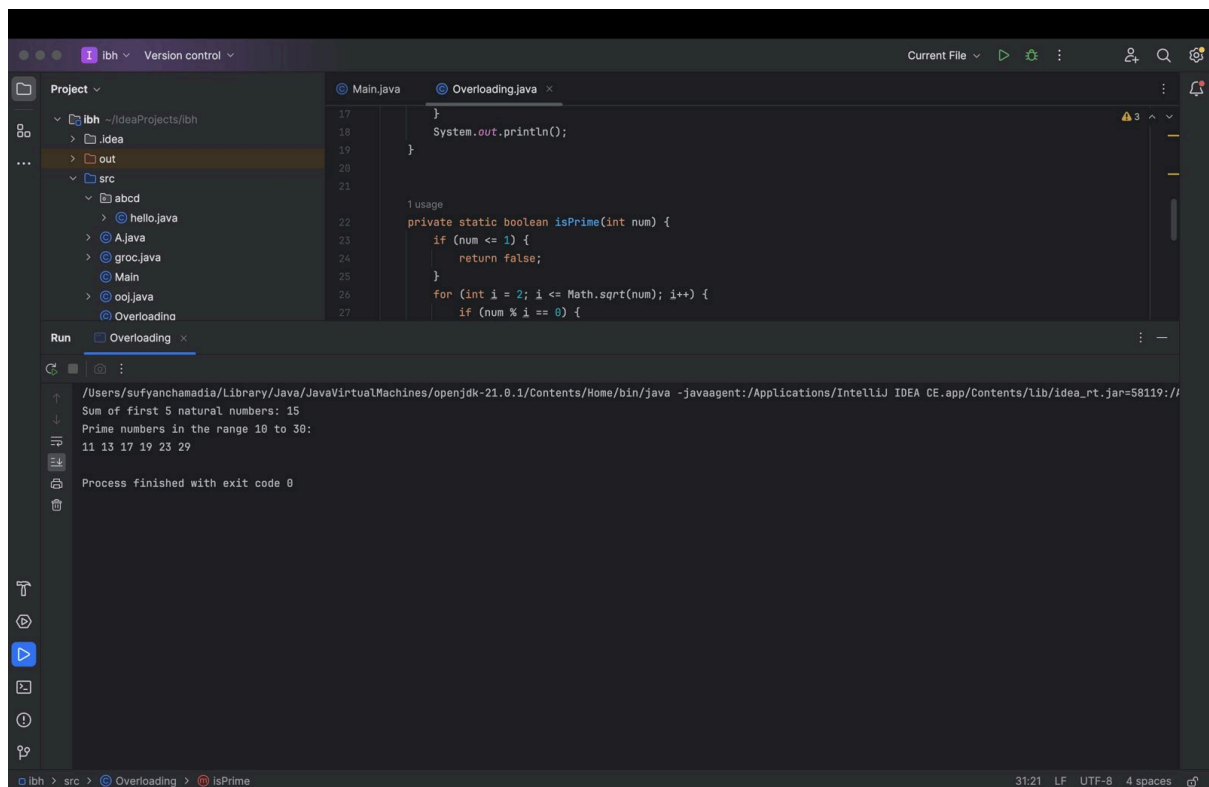
}

```

```

}

```



```

class Grocery {

    String c_name;

    String c_phone;


    double calculateTotalBill(int dalQty, int pulsesQty, int sugarQty) {

        double dalPrice = 50.0; // Price per kg for dal

        double pulsesPrice = 40.0; // Price per kg for pulses

        double sugarPrice = 30.0; // Price per kg for sugar


        double totalBill = (dalQty * dalPrice) + (pulsesQty * pulsesPrice) + (sugarQty *
sugarPrice);

        return totalBill;

    }


    public static void main(String[] args) {

        Grocery customer1 = new Grocery();

        customer1.c_name = "Customer1";

        customer1.c_phone = "1234567890";

        double bill1 = customer1.calculateTotalBill(2, 3, 1);


        Grocery customer2 = new Grocery();

        customer2.c_name = "Customer2";

        customer2.c_phone = "9876543210";

        double bill2 = customer2.calculateTotalBill(1, 2, 4);


        Grocery customer3 = new Grocery();

        customer3.c_name = "Customer3";

        customer3.c_phone = "5555555555";

        double bill3 = customer3.calculateTotalBill(3, 1, 2);

```

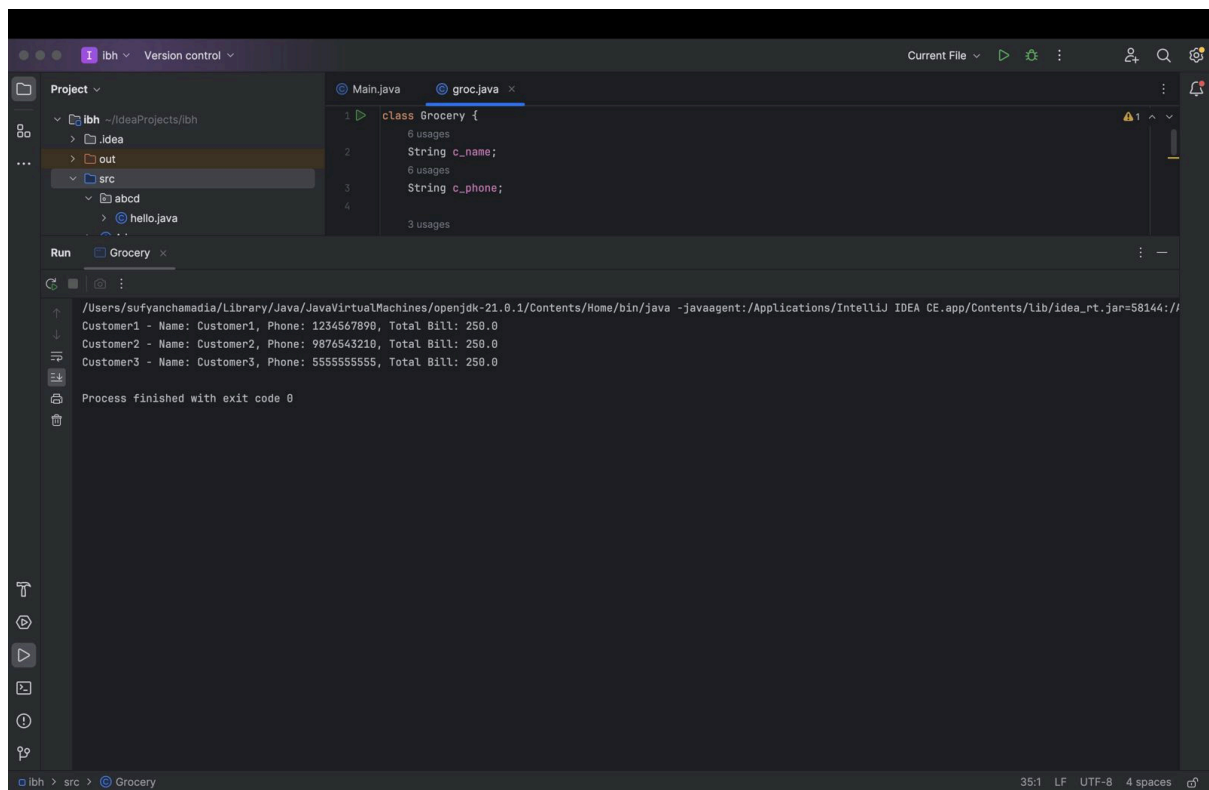
```
System.out.println("Customer1 - Name: " + customer1.c_name + ", Phone: " +  
customer1.c_phone + ", Total Bill: " + bill1);
```

```
System.out.println("Customer2 - Name: " + customer2.c_name + ", Phone: " +  
customer2.c_phone + ", Total Bill: " + bill2);
```

```
System.out.println("Customer3 - Name: " + customer3.c_name + ", Phone: " +  
customer3.c_phone + ", Total Bill: " + bill3);
```

```
}
```

```
}
```



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

```
public class QuadraticEquationSolver {
```

```
public static void main(String[] args) {
```

```
Scanner scanner = new Scanner(System.in);
```

```
// Input coefficients
```

```
System.out.print("Enter coefficient a: ");
```



```

double a = scanner.nextDouble();

System.out.print("Enter coefficient b: ");
double b = scanner.nextDouble();

System.out.print("Enter coefficient c: ");
double c = scanner.nextDouble();

// Calculate and display roots
calculateAndDisplayRoots(a, b, c);

scanner.close();
}

static void calculateAndDisplayRoots(double a, double b, double c) {
    // Calculate the discriminant
    double discriminant = b * b - 4 * a * c;

    // Check if the discriminant is non-negative
    if (discriminant >= 0) {
        // Calculate the roots
        double root1 = (-b + Math.sqrt(discriminant)) / (2 * a);
        double root2 = (-b - Math.sqrt(discriminant)) / (2 * a);

        // Display the roots
        System.out.println("Root 1: " + root1);
        System.out.println("Root 2: " + root2);
    } else {
        // If discriminant is negative, roots are imaginary

```

```

    double realPart = -b / (2 * a);

    double imaginaryPart = Math.sqrt(-discriminant) / (2 * a);

    // Display the roots as complex numbers

    System.out.println("Root 1: " + realPart + " + " + imaginaryPart + "i");

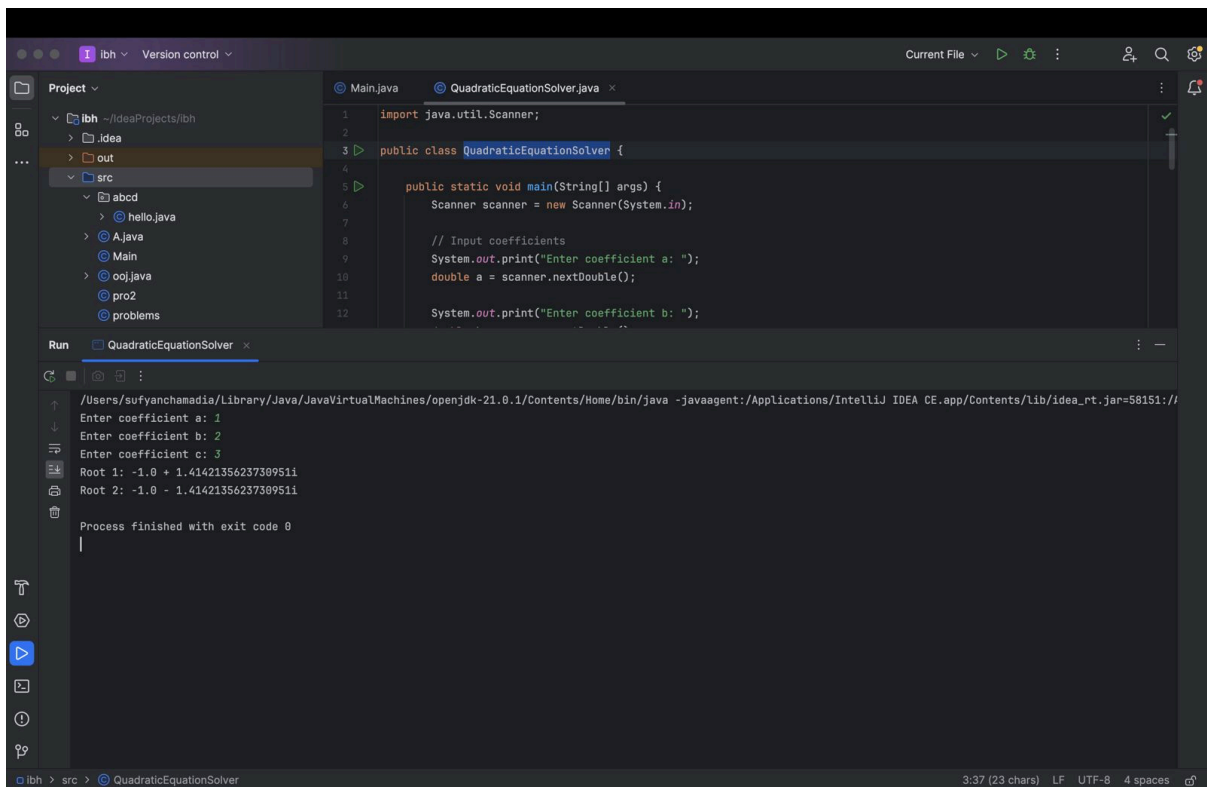
    System.out.println("Root 2: " + realPart + " - " + imaginaryPart + "i");

}

}

}

```



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

```
class Book {
```

```
    private String name;
```

```
    private String author;
```

```
    private double price;
```

```
private int num_pages;

// Constructor to set the values for the members
public Book(String name, String author, double price, int num_pages) {
    this.name = name;
    this.author = author;
    this.price = price;
    this.num_pages = num_pages;
}

// Methods to set and get the details of the objects
public void setName(String name) {
    this.name = name;
}

public void setAuthor(String author) {
    this.author = author;
}

public void setPrice(double price) {
    this.price = price;
}

public void setNumPages(int num_pages) {
    this.num_pages = num_pages;
}

public String getName() {
    return name;
}
```

```

    }

    public String getAuthor() {
        return author;
    }

    public double getPrice() {
        return price;
    }

    public int getNumPages() {
        return num_pages;
    }

    // toString method to display the complete details of the book
    public String toString() {
        return "Book Details - Name: " + name + ", Author: " + author + ", Price: $" +
            price + ", Number of Pages: " + num_pages;
    }
}

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

        System.out.println("Enter the number of books: ");
        int n = scanner.nextInt();

        Book[] books = new Book[n];

```

```

for (int i = 0; i < n; i++) {
    System.out.println("Enter details for Book " + (i + 1) + ":");
    System.out.print("Name: ");
    String name = scanner.next();

    System.out.print("Author: ");
    String author = scanner.next();

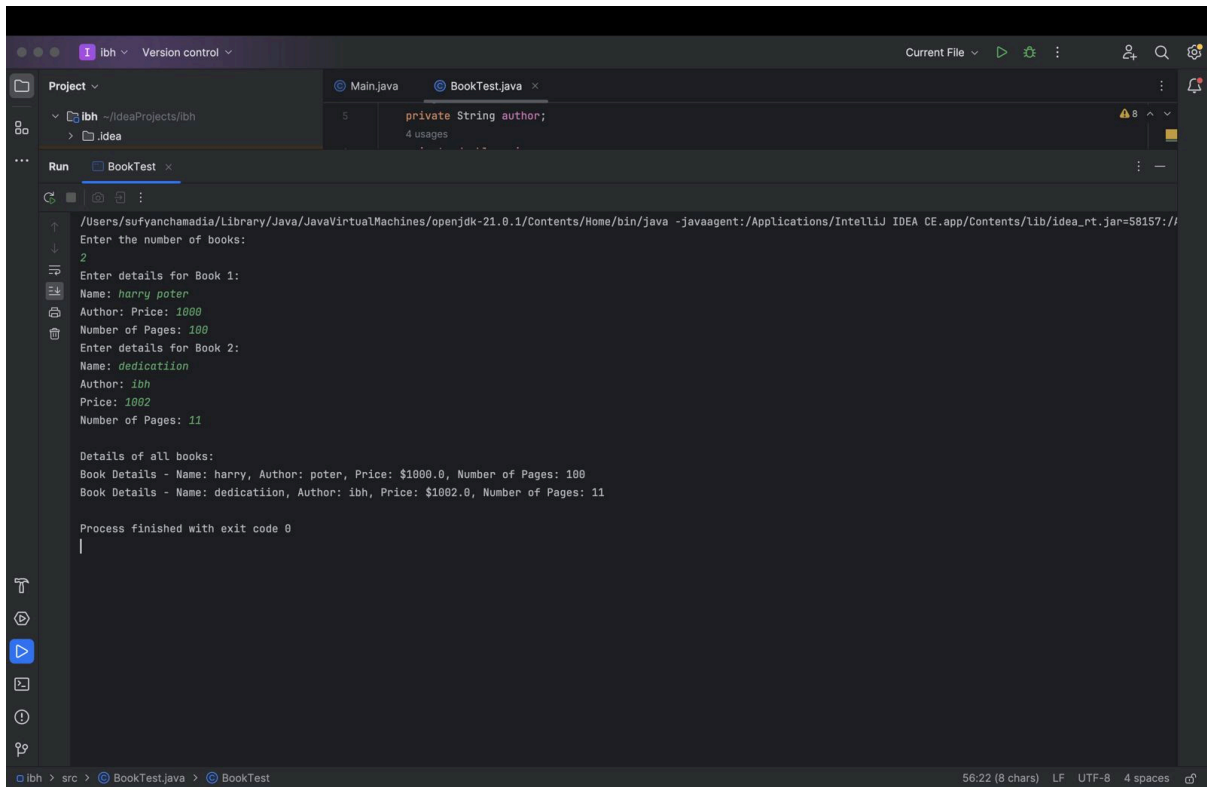
    System.out.print("Price: ");
    double price = scanner.nextDouble();

    System.out.print("Number of Pages: ");
    int numPages = scanner.nextInt();

    books[i] = new Book(name, author, price, numPages);
}

// Display details of all books
System.out.println("\nDetails of all books:");
for (int i = 0; i < n; i++) {
    System.out.println(books[i].toString());
}
}
}

```



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

```
abstract class Shape {
```

```
    protected int dimension1;
```

```
    protected int dimension2;
```

```
    public Shape(int dimension1, int dimension2) {
```

```
        this.dimension1 = dimension1;
```

```
        this.dimension2 = dimension2;
```

```
    }
```

```
    // Abstract method to be implemented by subclasses
```

```
    abstract void printArea();
```

```
}
```

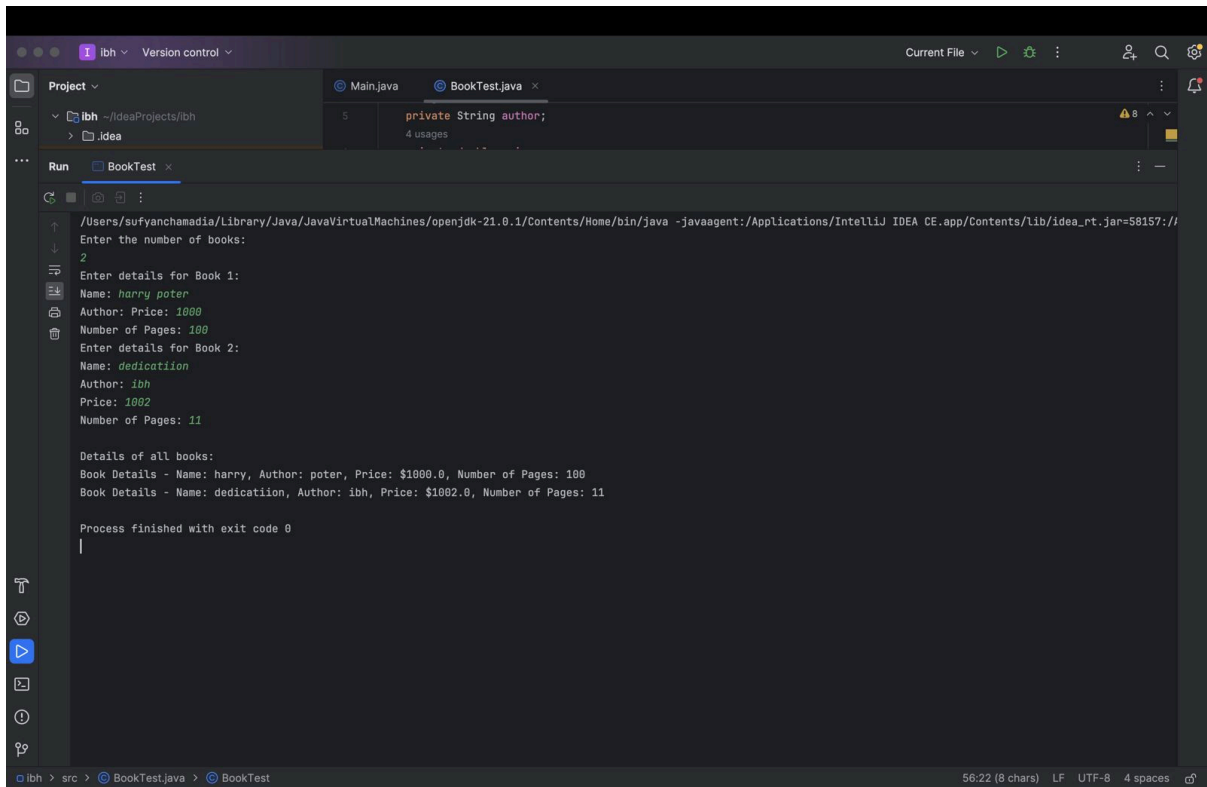
```
class Rectangle extends Shape {  
    public Rectangle(int length, int width) {  
        super(length, width);  
    }  
  
    @Override  
    void printArea() {  
        int area = dimension1 * dimension2;  
        System.out.println("Area of Rectangle: " + area);  
    }  
}
```

```
class Triangle extends Shape {  
    public Triangle(int base, int height) {  
        super(base, height);  
    }  
  
    @Override  
    void printArea() {  
        double area = 0.5 * dimension1 * dimension2;  
        System.out.println("Area of Triangle: " + area);  
    }  
}
```

```
class Circle extends Shape {  
    public Circle(int radius) {  
        super(radius, 0);  
    }  
}
```

```
@Override  
void printArea() {  
    double area = Math.PI * dimension1 * dimension1;  
    System.out.println("Area of Circle: " + area);  
}  
}
```

```
public class ShapeTest {  
    public static void main(String[] args) {  
        Scanner scanner = new Scanner(System.in);  
  
        // Example for Rectangle  
        Rectangle rectangle = new Rectangle(5, 8);  
        rectangle.printArea();  
  
        // Example for Triangle  
        Triangle triangle = new Triangle(4, 6);  
        triangle.printArea();  
  
        // Example for Circle  
        System.out.print("Enter the radius of the circle: ");  
        int radius = scanner.nextInt();  
        Circle circle = new Circle(radius);  
        circle.printArea();  
    }  
}
```

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

```
abstract class Shape {
```

```
    protected int dimension1;
```

```
    protected int dimension2;
```

```
    public Shape(int dimension1, int dimension2) {
```

```
        this.dimension1 = dimension1;
```

```
        this.dimension2 = dimension2;
```

```
    }
```

```
    // Abstract method to be implemented by subclasses
```

```
    abstract void printArea();
```

```
}
```

```
class Rectangle extends Shape {
```

```
public Rectangle(int length, int width) {  
    super(length, width);  
}
```

```
@Override
```

```
void printArea() {  
    int area = dimension1 * dimension2;  
    System.out.println("Area of Rectangle: " + area);  
}  
}
```

```
class Triangle extends Shape {  
    public Triangle(int base, int height) {  
        super(base, height);  
    }  
}
```

```
@Override
```

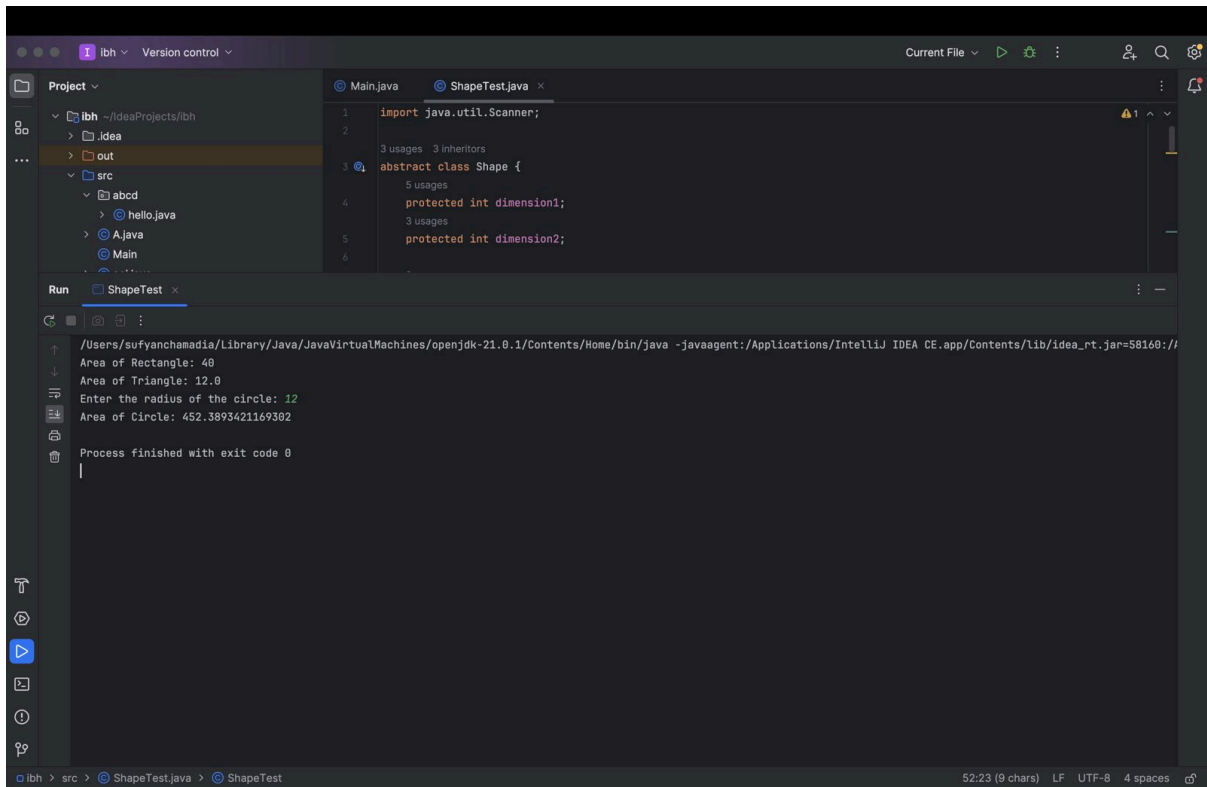
```
void printArea() {  
    double area = 0.5 * dimension1 * dimension2;  
    System.out.println("Area of Triangle: " + area);  
}  
}
```

```
class Circle extends Shape {  
    public Circle(int radius) {  
        super(radius, 0);  
    }  
}
```

```
@Override
```

```
void printArea() {  
    double area = Math.PI * dimension1 * dimension1;  
    System.out.println("Area of Circle: " + area);  
}  
}
```

```
public class ShapeTest {  
    public static void main(String[] args) {  
        Scanner scanner = new Scanner(System.in);  
  
        // Example for Rectangle  
        Rectangle rectangle = new Rectangle(5, 8);  
        rectangle.printArea();  
  
        // Example for Triangle  
        Triangle triangle = new Triangle(4, 6);  
        triangle.printArea();  
  
        // Example for Circle  
        System.out.print("Enter the radius of the circle: ");  
        int radius = scanner.nextInt();  
        Circle circle = new Circle(radius);  
        circle.printArea();  
    }  
}
```



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

```
class Account {
```

```
    String customerName;
```

```
    long accountNumber;
```

```
    String accountType;
```

```
    double balance;
```

```
    public Account(String customerName, long accountNumber, String accountType,  
double balance) {
```

```
        this.customerName = customerName;
```

```
        this.accountNumber = accountNumber;
```

```
        this.accountType = accountType;
```

```
        this.balance = balance;
```

```
    }
```

```
    void deposit(double amount) {
```

```

        balance += amount;

        System.out.println("Deposit successful. New balance: " + balance);
    }

    void displayBalance() {
        System.out.println("Account Number: " + accountNumber);
        System.out.println("Balance: " + balance);
    }

    void computeInterest() {
        // Default implementation for accounts with no interest
        System.out.println("This account type does not earn interest.");
    }

    void withdraw(double amount) {
        if (balance >= amount) {
            balance -= amount;
            System.out.println("Withdrawal successful. New balance: " + balance);
        } else {
            System.out.println("Insufficient funds. Withdrawal failed.");
        }
    }
}

class CurrentAccount extends Account {
    double minimumBalance;
    double serviceCharge;

    public CurrentAccount(String customerName, long accountNumber, double balance)
{

```

```

    super(customerName, accountNumber, "Current", balance);
    this.minimumBalance = 500; // Example minimum balance
    this.serviceCharge = 20; // Example service charge
}

```

@Override

```

void computeInterest() {
    // Current account does not earn interest
    System.out.println("Current account does not earn interest.");
}

```

@Override

```

void withdraw(double amount) {
    if (balance - amount >= minimumBalance) {
        balance -= amount;
        System.out.println("Withdrawal successful. New balance: " + balance);
    } else {
        System.out.println("Insufficient funds. Service charge of $" + serviceCharge + "
applied.");
        balance -= serviceCharge;
        System.out.println("New balance after service charge: " + balance);
    }
}
}
}

```

class SavingsAccount extends Account {

double interestRate;

```

    public SavingsAccount(String customerName, long accountNumber, double balance)
{

```

```
    super(customerName, accountNumber, "Savings", balance);  
    this.interestRate = 0.05; // Example interest rate (5%)  
}
```

@Override

```
void computeInterest() {  
    double interest = balance * interestRate;  
    balance += interest;  
    System.out.println("Interest computed and added. New balance: " + balance);  
}  
}
```

```
public class BankDemo {  
    public static void main(String[] args) {  
        Scanner scanner = new Scanner(System.in);  
  
        System.out.println("Welcome to the Bank!");  
  
        System.out.print("Enter your name: ");  
        String customerName = scanner.nextLine();  
  
        System.out.print("Enter your account number: ");  
        long accountNumber = scanner.nextLong();  
  
        System.out.print("Enter initial balance: ");  
        double initialBalance = scanner.nextDouble();  
  
        System.out.print("Enter account type (Current/Savings): ");  
        String accountType = scanner.next();  
    }  
}
```

```

// Choose the account type based on user input
Account userAccount;

if (accountType.equalsIgnoreCase("Current")) {
    userAccount = new CurrentAccount(customerName, accountNumber,
initialBalance);
} else if (accountType.equalsIgnoreCase("Savings")) {
    userAccount = new SavingsAccount(customerName, accountNumber,
initialBalance);
} else {
    System.out.println("Invalid account type. Exiting.");
    return;
}

while (true) {
    System.out.println("\nChoose an option:");
    System.out.println("1. Deposit");
    System.out.println("2. Withdraw");
    System.out.println("3. Check Balance");
    System.out.println("4. Exit");

    int choice = scanner.nextInt();

    switch (choice) {
        case 1:
            System.out.print("Enter deposit amount: ");
            double depositAmount = scanner.nextDouble();
            userAccount.deposit(depositAmount);
            break;
        case 2:

```



```

        System.out.print("Enter withdrawal amount: ");

        double withdrawalAmount = scanner.nextDouble();

        userAccount.withdraw(withdrawalAmount);

        break;

    case 3:

        userAccount.displayBalance();

        break;

    case 4:

        System.out.println("Thank you for using the Bank. Exiting.");

        return;

    default:

        System.out.println("Invalid option. Please choose again.");

    }

}

}

}

}

```

```

/Users/sufyanchamadia/Library/Java/JavaVirtualMachines/openjdk-21.0.1/Contents/Home/bin/java -javaagent:/Applications/IntelliJ IDEA CE.app/Contents/lib/idea_rt.jar=58166:/
Welcome to the Bank!
Enter your name: ibhrahim
Enter your account number: 111222222
Enter initial balance: 1000
Enter account type (Current/Savings): Current

Choose an option:
1. Deposit
2. Withdraw
3. Check Balance
4. Exit
1
Enter deposit amount: 1000
Deposit successful. New balance: 2000.0

Choose an option:
1. Deposit
2. Withdraw
3. Check Balance
4. Exit
2
Enter withdrawal amount: 500
Withdrawal successful. New balance: 1500.0

Choose an option:
1. Deposit
2. Withdraw
3. Check Balance
4. Exit

```

```
package CIE;
```

```
public class Student {
```

```
    String usn;
```

```
    String name;
```

```
    int sem;
```

```
    public Student(String usn, String name, int sem) {
```

```
        this.usn = usn;
```

```
        this.name = name;
```

```
        this.sem = sem;
```

```
    }
```

```
}
```

```
package CIE;
```

```
public class Internals extends Student {
```

```
    int[] internalMarks;
```

```
    public Internals(String usn, String name, int sem, int[] internalMarks) {
```

```
        super(usn, name, sem);
```

```
        this.internalMarks = internalMarks;
```

```
    }
```

```
}
```

```
package SEE;
```

```
import CIE.Student;
```

```
public class External extends Student {
```

```
    int[] externalMarks;
```

```

    public External(String usn, String name, int sem, int[] externalMarks) {
        super(usn, name, sem);
        this.externalMarks = externalMarks;
    }
}

import CIE.Internals;
import SEE.External;

public class Main {
    public static void main(String[] args) {
        // Example usage
        int[] internalMarks = {75, 80, 85, 90, 95};
        Internals studentCIE = new Internals("123", "John Doe", 3, internalMarks);

        int[] externalMarks = {85, 90, 75, 88, 92};
        External studentSEE = new External("123", "John Doe", 3, externalMarks);

        // Calculate final marks and display
        displayFinalMarks(studentCIE, studentSEE);
    }

    static void displayFinalMarks(Internals cie, External see) {
        System.out.println("Student Details:");
        System.out.println("USN: " + cie.usn);
        System.out.println("Name: " + cie.name);
        System.out.println("Semester: " + cie.sem);

        System.out.println("\nInternal Marks:");
    }
}

```

```

    for (int i = 0; i < cie.internalMarks.length; i++) {
        System.out.println("Course " + (i + 1) + ": " + cie.internalMarks[i]);
    }

    System.out.println("\nExternal Marks:");
    for (int i = 0; i < see.externalMarks.length; i++) {
        System.out.println("Course " + (i + 1) + ": " + see.externalMarks[i]);
    }

    // Calculate and display final marks
    int[] finalMarks = calculateFinalMarks(cie.internalMarks, see.externalMarks);
    System.out.println("\nFinal Marks:");
    for (int i = 0; i < finalMarks.length; i++) {
        System.out.println("Course " + (i + 1) + ": " + finalMarks[i]);
    }
}

static int[] calculateFinalMarks(int[] internalMarks, int[] externalMarks) {
    int[] finalMarks = new int[internalMarks.length];
    for (int i = 0; i < finalMarks.length; i++) {
        // Assuming a simple average for final marks
        finalMarks[i] = (internalMarks[i] + externalMarks[i]) / 2;
    }
    return finalMarks;
}
}

```

Student Details:

USN: 1BM123

Name: John Doe

Semester: 3

Internal Marks:

80 75 85 90 88

External Marks:

75 70 80 85 78

```
class WrongAgeException extends Exception {
```

```
    WrongAgeException(String message) {
```

```
        super(message);
```

```
    }
```

```
}
```

```
class Father {
```

```
    int fatherAge;
```

```
    Father(int age) throws WrongAgeException {
```

```
        if (age < 0) {
```

```
            throw new WrongAgeException("Age cannot be negative");
```

```
        }
```

```
        fatherAge = age;
```

```
        System.out.println("Father's age set to: " + fatherAge);
```

```
    }
```

```
}
```

```
class Son extends Father {
```

```
    int sonAge;
```

```

Son(int fatherAge, int sonAge) throws WrongAgeException {
    super(fatherAge);

    if (sonAge >= fatherAge) {
        throw new WrongAgeException("Son's age should be less than father's age");
    }

    this.sonAge = sonAge;
    System.out.println("Son's age set to: " + sonAge);
}
}

public class ExceptionInheritanceDemo {
    public static void main(String[] args) {
        try {
            // Creating a Father object with negative age (will throw an exception)
            Father father = new Father(-50);
        } catch (WrongAgeException e) {
            System.out.println("Exception caught: " + e.getMessage());
        }

        try {
            // Creating a Son object with valid ages (no exception)
            Son son = new Son(40, 20);
        } catch (WrongAgeException e) {
            System.out.println("Exception caught: " + e.getMessage());
        }
    }
}

```

```

    try {

        // Creating a Son object with son's age greater than or equal to father's age (will
        throw an exception)

        Son sonWithWrongAge = new Son(30, 35);

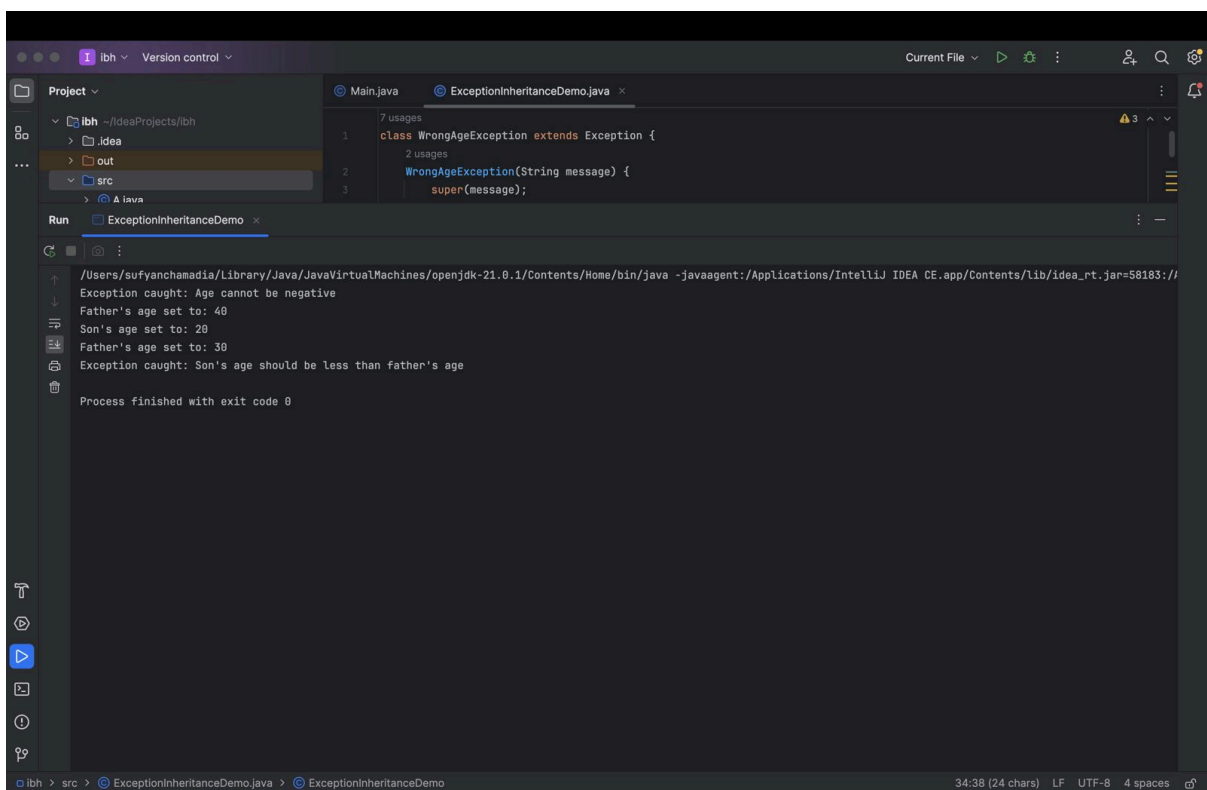
    } catch (WrongAgeException e) {

        System.out.println("Exception caught: " + e.getMessage());

    }

}
}

```



```

class DisplayThread extends Thread {

    private String message;

    private int sleepTime;

    public DisplayThread(String message, int sleepTime) {

        this.message = message;

        this.sleepTime = sleepTime;
    }
}

```

```

    }

    @Override
    public void run() {
        while (true) {
            System.out.println(message);

            try {
                Thread.sleep(sleepTime * 1000); // Convert seconds to milliseconds
            } catch (InterruptedException e) {
                e.printStackTrace();
            }
        }
    }
}

public class DisplayProgram {
    public static void main(String[] args) {
        // Create and start the first thread
        DisplayThread thread1 = new DisplayThread("BMS College of Engineering", 10);
        thread1.start();

        // Create and start the second thread
        DisplayThread thread2 = new DisplayThread("CSE", 2);
        thread2.start();
    }
}

```