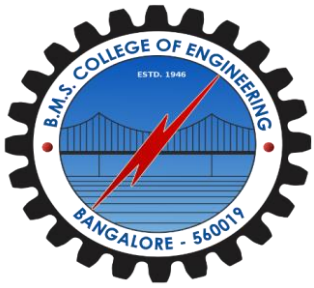
B.M.S. COLLEGE OF ENGINEERING

(Autonomous College Affiliated to Visvesvaraya Technological University, Belgaum)
Bull Temple Road, Basavanagudi, Bengaluru – 560019



LAB REPORT

On

Object Oriented Java Programming

(23CS3PCOOJ)

Submitted By :

HIMANI B

1BM22CS112

In partial fulfilment of

BACHELOR OF ENGINEERING

In

COMPUTER SCIENCE AND ENGINEERING

2023-24

B.M.S. COLLEGE OF ENGINEERING

(Autonomous College Affiliated to Visvesvaraya Technological University, Belgaum)
Bull Temple Road, Basavanagudi, Bengaluru – 560019

Department of

Computer Science & Engineering (CSE)

CERTIFICATE

This is to certify that the Lab work entitled "Object Oriented Programming in Java (22CS3PCOOJ)" conducted by **Himani b (1BM22CS112),** who is bonafide student at **B.M.S.College of Engineering**. It is in partial fulfilment for the award of **Bachelor of Engineering in Computer Science and Engineering** during the academic year 2023-24. The Lab report has been approved as it satisfies the academic requirements in respect of Object Oriented Programming in Java (22CS3PCOOJ) work prescribed for the said degree.

Himani.b

1BM22CS112

BMSCE, Bengaluru-19

Shravya AR

Assistant Professor

Department of CSE

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1) Quadratic Equations:

```
import java.util.Scanner;


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


  // Input coefficients a, b, and c
  System.out.println("Enter the coefficients of the quadra c equation (ax^2 + bx + c = 0):");
System.out.print("a: ");
 double a = scanner.nextDouble();
System.out.print("b: ");
double b = scanner.nextDouble();
System.out.print("c: ");
double c = scanner.nextDouble();
// Calculate the discriminant
 double discriminant = b * b - 4 * a * c;
 // Check if there are real solu ons
 if (discriminant > 0) {
// Two real solu ons
double root1 = (-b + Math.sqrt(discriminant)) / (2 * a);
double root2 = (-b - Math.sqrt(discriminant)) / (2 * a);
System.out.println("Two real solutions exist:");
 System.out.println("Root 1: " + root1);
System.out.println("Root 2: " + root2);
 } else if (discriminant == 0) {
// One real solution
  double root = -b / (2 * a);
  System.out.println("One real solu on exists:");
  System.out.println("Root: " + root);
   }
else {
  // No real solutions
```

```
            System.out.println("No real solutions exist.");
        }
 scanner.close();
    }
}
```

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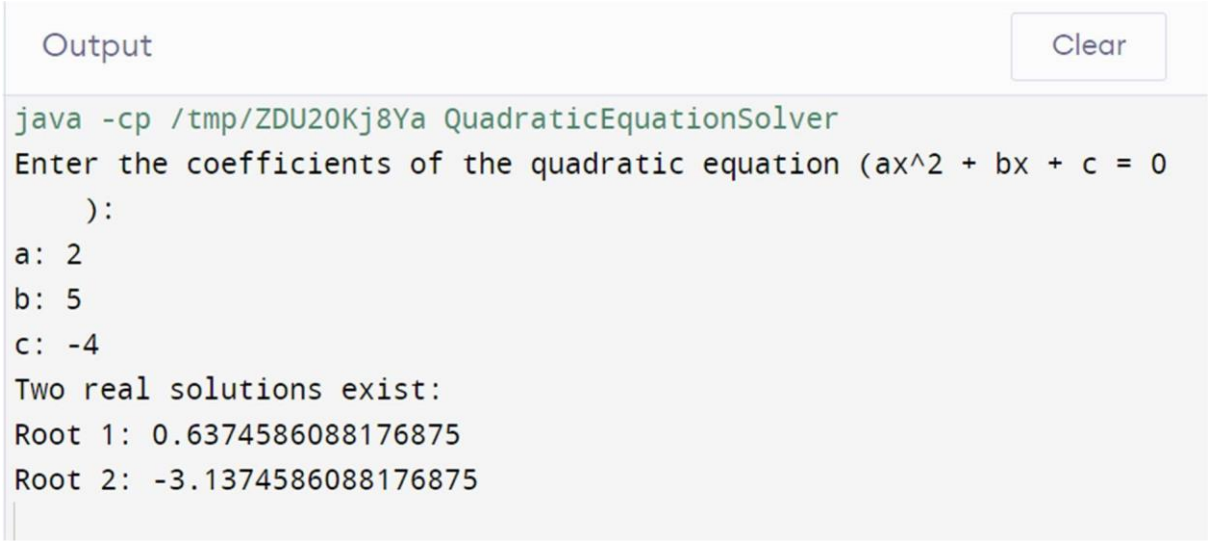
Output:



2) STUDENT CLASS

```
import java.util.Scanner;


class Student {
private String usn;
private String name;
private int[] credits;
private int[] marks;
```

```
    // Constructor
 public Student(String usn, String name, int numSubjects) {
this.usn = usn;
this.name = name;
this.credits = new int[numSubjects];
this.marks = new int[numSubjects];
    }
// Method to accept details of the student
public void acceptDetails(Scanner scanner) {
 System.out.println("Enter details for student " + name + ":");
System.out.print("Enter USN: ");
this.usn = scanner.next();
 System.out.print("Enter Name: ");
 this.name = scanner.next();
System.out.println("Enter details for each subject:");
 for (int i = 0; i < credits.length; i++) {
System.out.print("Enter credits for subject " + (i + 1) + ": ");
this.credits[i] = scanner.nextInt();
System.out.print("Enter marks for subject " + (i + 1) + ": ");
this.marks[i] = scanner.nextInt();
        }
    }


    // Method to display details of the student
public void displayDetails() {
        System.out.println("USN: " + this.usn);
        System.out.println("Name: " + this.name);
System.out.println("Subject-wise details:");
for (int i = 0; i < credits.length; i++) {
            System.out.println("Subject " + (i + 1) + ": Credits - " + credits[i] + ", Marks - " + marks[i]);         }
    }
```

```
    // Method to calculate SGPA of the student     public double
calculateSGPA() {
int totalCredits = 0;
double totalGradePoints = 0.0;
for (int i = 0; i < credits.length; i++)
{ totalCredits += credits[i];
totalGradePoints +=calculateGradePoints(marks[i]) * credits[i];
}
        return totalGradePoints / totalCredits;
    }
    // Helper method to calculate grade points based on marks
 private double calculateGradePoints(int marks)
{         if (marks >= 90) return 10;
else if (marks >= 80) return 9;
else if (marks >= 70) return 8;
else if (marks >= 60) return 7;
else if (marks >= 50) return 6;
 else if (marks >= 40) return 5;
else return 0;
    }
}

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

        // Accept details of the student
        System.out.print("Enter the number of subjects: ");
int numSubjects = scanner.nextInt();
        Student student = new Student("", "", numSubjects);
student.acceptDetails(scanner);

        // Display details of the student
```

```
        System.out.println("\nDetails of the student:");
student.displayDetails();

        // Calculate and display SGPA
double sgpa = student.calculateSGPA();
        System.out.println("\nSGPA: " + sgpa);

        scanner.close();
    }
}
```

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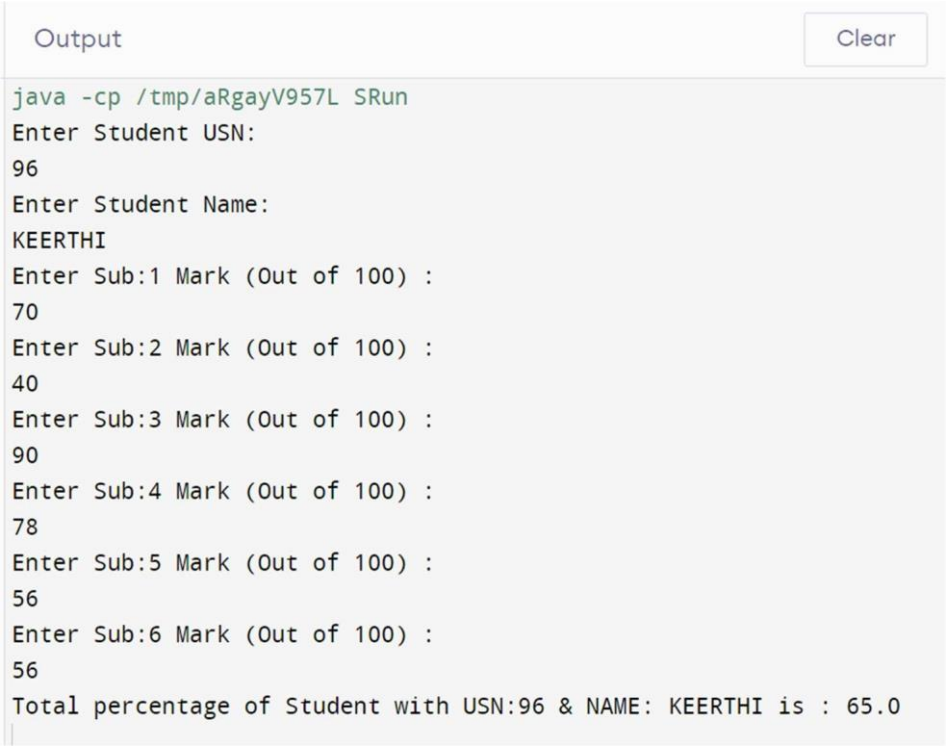
OUTPUT:



3) BOOK CLASS

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

```
class Book {     private
String name;     private
String author;     private
double price;     private
int numPages;

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

   // Se er methods     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 numPages) {
this.numPages = numPages;
   }

   // Ge er methods     public
String       getName()       {
return name;
   }
```

```
    public String getAuthor() {
return author;
    }

    public double getPrice() {
return price;
    }

    public int getNumPages() {
return numPages;
    }

    // toString method to display complete details of the book
public String toString() {
        return "Book Details:\nName: " + name + "\nAuthor: " + author + "\nPrice: $" + price + "\nNumber of
Pages: " + numPages;
    }
}

public class Main {     public sta c void
main(String[] args) {
        Scanner scanner = new Scanner(System.in);

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

        // Create an array to hold n book objects
        Book[] books = new Book[n];

        // Input details for each book
for (int i = 0; i < n; i++) {
            System.out.println("\nEnter 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();

            // Create a new Book object with the input details
books[i] = new Book(name, author, price, numPages);
        }

        // Display details of all the books
        System.out.println("\nDetails of all books:");
for (int i = 0; i < n; i++) {
            System.out.println("\nBook " + (i + 1) + ":\n" + books[i].toString());
        }

        scanner.close();
    }
}
```

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Output

```
java -cp /tmp/pw1qEJZRkF BRun
Enter the number of books:
2
Books 1:
Enter name of the book: JAVA

Enter Author: MR.JOHN

Enter price: 1800

Enter number of pages: 1000
Books 2:
Enter name of the book: COA

Enter Author: DR.UMADEVI

Enter price: 1200

Enter number of pages: 1100
Book: 1
Book Name : JAVA
Author Name : MR.JOHN
Price : 1800
Number of Pages : 1000

Book: 2
Book Name : COA
Author Name : DR.UMADEVI
Price : 1200
Number of Pages : 1100
```

4) SHAPE CLASS

```
abstract class Shape {
public int side1, side2;
abstract void printArea();
```

```
}


class Rectangle extends Shape {
Rectangle(int length, int breadth) {
this.side1 = length;        this.side2 =
breadth;
   }
   void printArea() {
      System.out.println("The Area of Rectangle : " + (side1 * side2));
   }
}

class Triangle extends Shape {
Triangle(int base, int height) {
this.side1 = base;
this.side2 = height;
   }
   void printArea() {
      System.out.println("The Area of Triangle : " + (0.5 * side1 * side2));
   }
}

class Circle extends Shape {
Circle(int rad) {        this.side1
= this.side2 = rad;
   }
   void printArea() {
      System.out.println("The Area of Circle : " + (3.14 * side1 * side2));
   }
}
```

```
class SRun{     public sta c void
main(String[] args) {
        Rectangle r = new Rectangle(10, 10);
        Triangle t = new Triangle(5, 10);
        Circle c = new Circle(5);

        r.printArea();
        t.printArea();
        c.printArea();
    }
}
```

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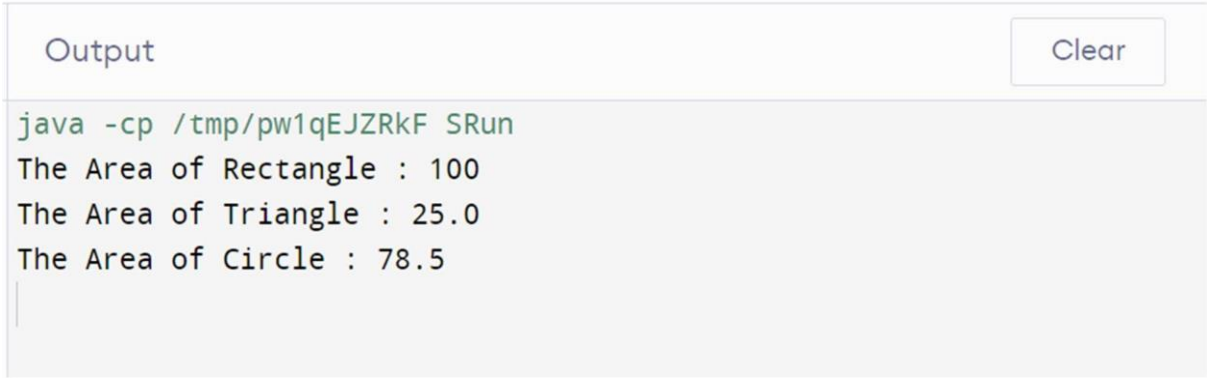

5) BANK CLASS

```
import java.u l.Scanner;

abstract class Account {
String customerName;
int accountNumber;
String accountType;
double balance;
```

```
    Account(String customerName, int accountNumber, String accountType, double balance)
{        this.customerName = customerName;         this.accountNumber = accountNumber;
this.accountType = accountType;         this.balance = balance;
    }

    abstract void deposit(double amount);

    abstract void displayBalance();

    abstract void computeInterest();

    abstract void withdraw(double amount);
}

class SavingsAccount extends Account {
    SavingsAccount(String customerName, int accountNumber, String accountType, double balance) {
super(customerName, accountNumber, accountType, balance);
    }

    void deposit(double amount) {
balance += amount;
        System.out.println("Amount deposited: " + amount);
    }

    void displayBalance() {
        System.out.println("Balance: " + balance);
    }
    void computeInterest() {         double
interestRate = 0.05;         double interest =
balance * interestRate;         balance +=
interest;
        System.out.println("Interest added: " + interest);
    }
```

```
    void withdraw(double amount) {
if (balance < amount) {
            System.out.println("Insufficient balance");
        } else {
balance -= amount;
            System.out.println("Amount withdrawn: " + amount);
        }
    }
}

class CurrentAccount extends Account {
double minimumBalance = 1000;
double serviceCharge = 50;

    CurrentAccount(String customerName, int accountNumber, String accountType, double balance) {
super(customerName, accountNumber, accountType, balance);
    }

    void deposit(double amount) {
balance += amount;
        System.out.println("Amount deposited: " + amount);
    }

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

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

```
    void withdraw(double amount) {         if
(balance - amount < minimumBalance) {
System.out.println("Insufficient balance");
balance -= serviceCharge;
            System.out.println("Service charge: " + serviceCharge);
        } else {
balance -= amount;
            System.out.println("Amount withdrawn: " + amount);
        }
    }
}

class Brun {     public sta c void
main(String[] args) {
        Scanner sc = new Scanner(System.in);

        System.out.print("Enter customer name: ");
        String customerName = sc.nextLine();

        System.out.print("Enter account number: ");
int accountNumber = sc.nextInt();

        System.out.print("Enter account type (savings/current): ");
        String accountType = sc.next();

        System.out.print("Enter ini al balance: ");
double balance = sc.nextDouble();
System.out.println("\n");

        Account account;         if (accountType.equals("savings")) {             account = new
SavingsAccount(customerName, accountNumber, accountType, balance);
        } else {
```

```
            account = new CurrentAccount(customerName, accountNumber, accountType, balance);
        }

        while (true) {
            System.out.println("\n1. Deposit");
            System.out.println("2. Display balance");
            System.out.println("3. Compute interest");
            System.out.println("4. Withdraw");
            System.out.println("5. Exit\n");

            System.out.print("Enter choice: ");
int choice = sc.nextInt();

            switch (choice) {
case 1:
                System.out.print("\nEnter amount to deposit: ");
double amount = sc.nextDouble();
account.deposit(amount);
                break;
case 2:
                account.displayBalance();
                break;
case 3:
                account.computeInterest();
                break;
case 4:
                System.out.print("\nEnter amount to withdraw: ");
                amount = sc.nextDouble();
account.withdraw(amount);
                break;
case 5:
sc.close();
```

```
System.exit(0);
break;                default:
                System.out.println("\nInvalid choice");
        }
    }
  }
}
```

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Output Clear

```
java -cp /tmp/pw1qEJZRkF Brun
Enter customer name: KEERTHI
Enter account number: 12345
Enter account type (savings/current): SAVINGS
Enter initial balance: 20000



1. Deposit
2. Display balance
3. Compute interest
4. Withdraw
5. Exit

Enter choice: 2
Balance: 20000.0

1. Deposit
2. Display balance
3. Compute interest
```

```
Enter choice: 1

Enter amount to deposit: 500
Amount deposited: 500.0

1. Deposit
2. Display balance
3. Compute interest
4. Withdraw
5. Exit

Enter choice: 3
Current account does not earn interest

1. Deposit
2. Display balance
3. Compute interest
4. Withdraw
5. Exit
```

```
Enter choice: 4

Enter amount to withdraw: 10000
Amount withdrawn: 10000.0

1. Deposit
2. Display balance
3. Compute interest
4. Withdraw
5. Exit
```

4) STUDENTS MARKS

// File: CIE/Student.java

package CIE;

public class Student {

```
    protected String usn;
protected String name;
protected int sem;

    public Student(String usn, String name, int sem)
{       this.usn = usn;         this.name = name;
this.sem = sem;
    }
}



// File: CIE/Internals.java
package CIE;

public class Internals extends Student {
protected int[] internalMarks = new int[5];

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

//                          File:
SEE/External.java
package    SEE;    import
CIE.*;

public class External extends Student {
protected int[] externalMarks = new int[5];

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

        this.externalMarks = externalMarks;
```

```
    }
}

// File: Main.java
import CIE.*;
import SEE.*;

public class Main {     public sta c void
main(String[] args) {
        // Example usage
        // Internal marks for student 1         int[]
internalMarks1 = {80, 75, 85, 90, 88};
        Internals student1Internal = new Internals("1MS16CS001", "Alice", 3, internalMarks1);

        // External marks for student 1         int[]
externalMarks1 = {70, 68, 75, 80, 72};
        External student1External = new External("1MS16CS001", "Alice", 3, externalMarks1);

        // Display final marks for student 1
        System.out.println("Student 1 Final Marks:");
        for (int i = 0; i < 5; i++) {
            int finalMarks = student1Internal.internalMarks[i] + student1External.externalMarks[i];
System.out.println("Course " + (i + 1) + ": " + finalMarks);
        }
    }
}
```

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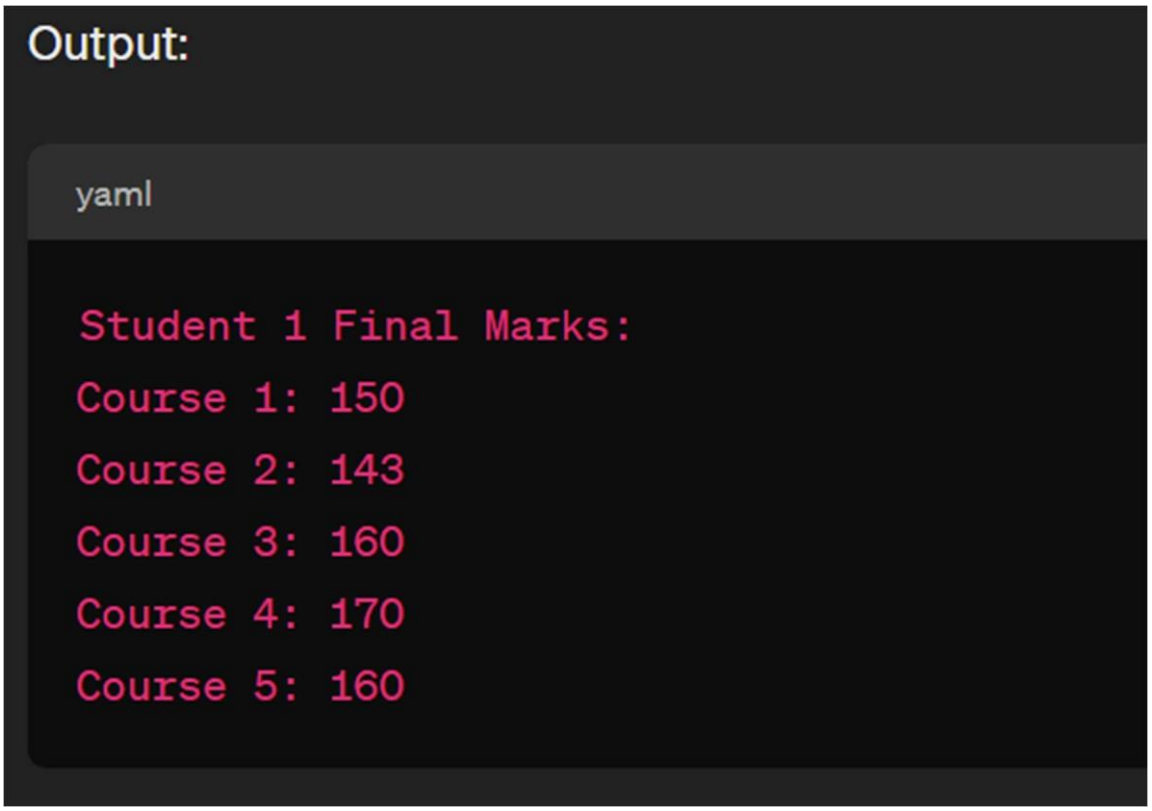
OUTPUT:



6) EXCEPTIONAL HANDLING

```
import java.u l.Scanner;


class WrongAge extends Excep on {
public WrongAge() {
super("Invalid age!");
    }
}


class Father {
private int age;


    public Father(int age) throws WrongAge {
        if (age < 0) {
throw new WrongAge();
        }
        this.age = age;
```

```
    }

    public int getAge() {
return age;
    }
}

class Son extends Father {
private int sonAge;

    public Son(int fatherAge, int sonAge) throws WrongAge {
super(fatherAge);

        if (sonAge >= fatherAge) {
throw new WrongAge();
        }
        this.sonAge = sonAge;
    }

    public int getSonAge() {
return sonAge;
    }
}

public class EMain{     public sta c void
main(String[] args) {
        Scanner scanner = new Scanner(System.in);
         try
{
            System.out.print("Enter father's age: ");
int fatherAge = scanner.nextInt();

            System.out.print("Enter son's age: ");
```

```
            int sonAge = scanner.nextInt();

            Father father = new Father(fatherAge);
            System.out.println("Father's age: " + father.getAge());

            Son son = new Son(fatherAge, sonAge);
            System.out.println("Son's age: " + son.getSonAge());
        } catch (WrongAge e) {
            System.out.println(e.getMessage());
        } catch (Excep on e) {
            System.out.println("Invalid input.");
        } finally {
scanner.close();
        }
    }
```

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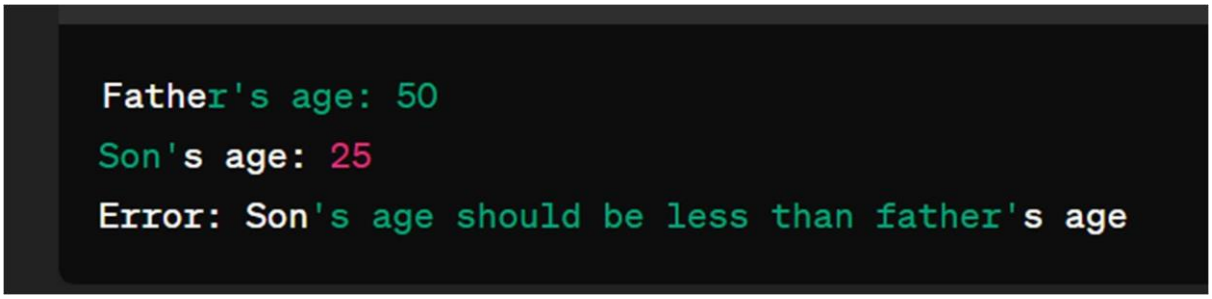
OUTPUT:



8) MULTI-THREADING

```
class DisplayThread extends Thread
{    private String message;
private int interval;
```

```
   public DisplayThread(String message, int interval)
{          this.message = message;          this.interval =
interval;
   }

   public void run() {
      try {            for(int i =
0; i < 5; i++) {
            System.out.println(message);
            Thread.sleep(interval * 1000);
         }
      } catch (InterruptedExcep on e) {
         e.printStackTrace();
      }
   }
}

class ThreadDemo {     public sta c void
main(String[] args) {
      DisplayThread thread1 = new DisplayThread("BMS College of Engineering", 10);
      thread1.start();

      DisplayThread thread2 = new DisplayThread("CSE", 2);
thread2.start();
   }
}
```

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Output

```
java -cp /tmp/fwatUdZmmH ThreadDemo
BMS College of Engineering
CSE
CSE
CSE
CSE
CSE
BMS College of Engineering
BMS College of Engineering
BMS College of Engineering
BMS College of Engineering
```

THANK YOU