VISVESVARAYA TECHNOLOGICAL UNIVERSITY

"JnanaSangama", Belgaum -590014, Karnataka.

LAB REPORT
on

Object Oriented Java Programming

(23CS3PCOOJ)

Submitted by

Himika Kakhani (1BM23CS112)

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
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B.M.S. College of Engineering

Bull Temple Road, Bangalore 560019

(Affiliated To Visvesvaraya Technological University, Belgaum)

Department of Computer Science and Engineering

CERTIFICATE

This is to certify that the Lab work entitled "Object Oriented Java Programming (23CS3PCOOJ)" carried out by **Himika Kakhani (1BM23CS112),** 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. The Lab report has been approved as it satisfies the academic requirements in respect of an Object Oriented Java Programming (23CS3PCOOJ) work prescribed for the said degree.

Lab faculty Incharge Name Assistant Professor Department of CSE, BMSCE	Dr. Jyothi S Nayak Professor & HOD Department of CSE, BMSCE

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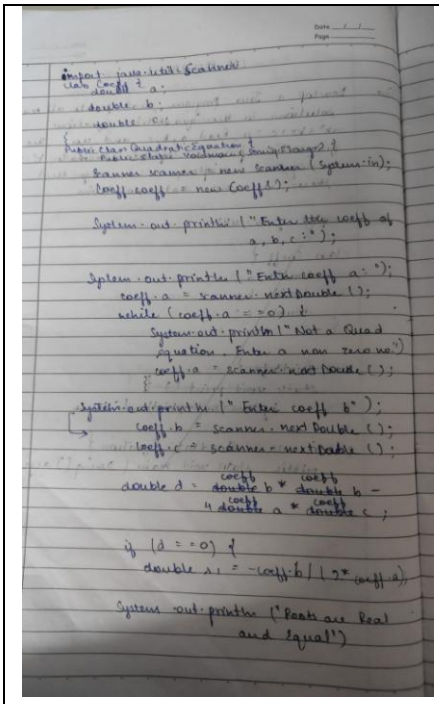
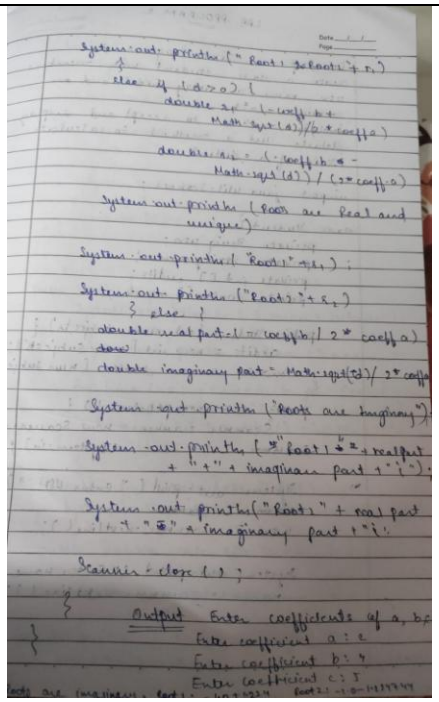
Github Link: https://github.com/himika03/Java/blob/main/Main.java

Program 1

Quadratic Equation

Algorithm:





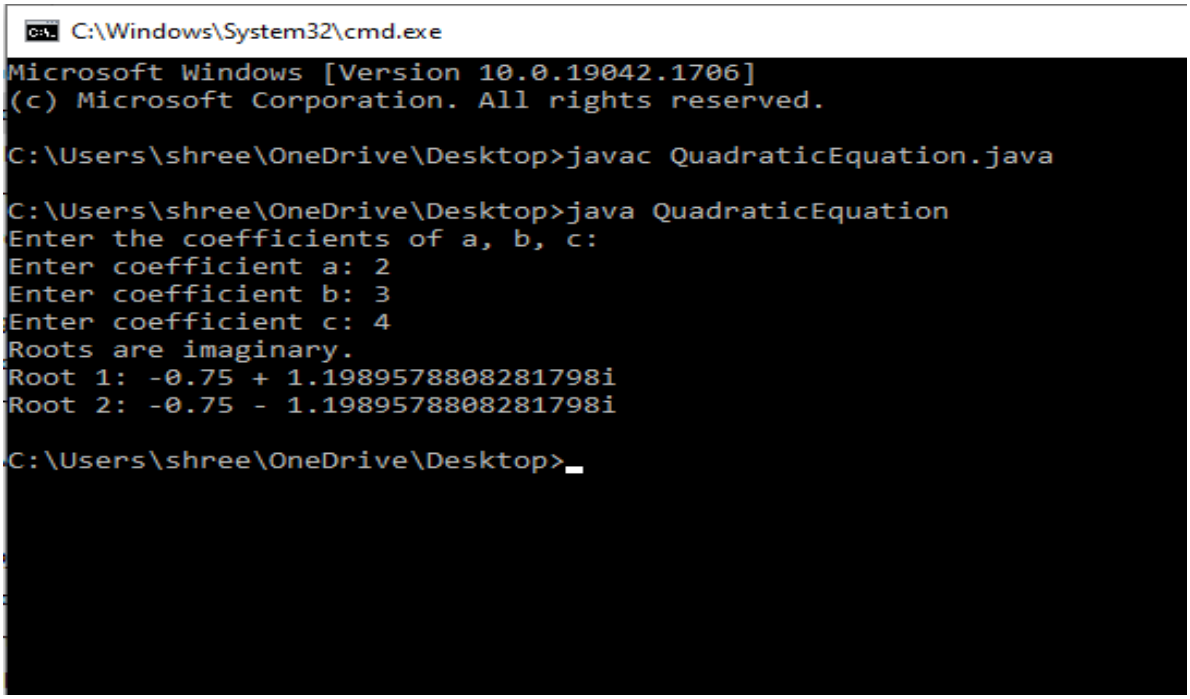
Code:

```
import java.util.Scanner;

class Coeff {
   double a;
   double b;
   double c;
}


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

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

System.out.println("Enter the coefficients of a, b, c:");

System.out.print("Enter coefficient a: ");
coeff.a = scanner.nextDouble();
while (coeff.a == 0) {
   System.out.println("Not a quadratic equation. Please enter a non-zero value for a:");
   coeff.a = scanner.nextDouble();
}

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

double d = coeff.b * coeff.b - 4 * coeff.a * coeff.c;

if (d == 0) {
   double r1 = -coeff.b / (2 * coeff.a);
   System.out.println("Roots are real and equal.");
   System.out.println("Root 1 and Root 2: " + r1);
} else if (d > 0) {
   double r1 = (-coeff.b + Math.sqrt(d)) / (2 * coeff.a);
   double r2 = (-coeff.b - Math.sqrt(d)) / (2 * coeff.a);
   System.out.println("Roots are real and unique.");
   System.out.println("Root 1: " + r1);
   System.out.println("Root 2: " + r2);
} else {
   double realPart = -coeff.b / (2 * coeff.a);
   double imaginaryPart = Math.sqrt(-d) / (2 * coeff.a);
   System.out.println("Roots are imaginary.");
   System.out.println("Root 1: " + realPart + " + " + imaginaryPart + "i");
   System.out.println("Root 2: " + realPart + " - " + imaginaryPart + "i");
```

```
    }

    scanner.close();
  }
}
```

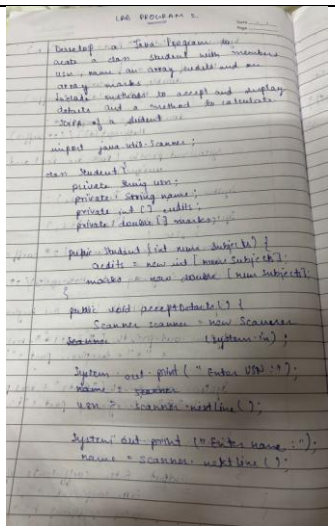
Output:

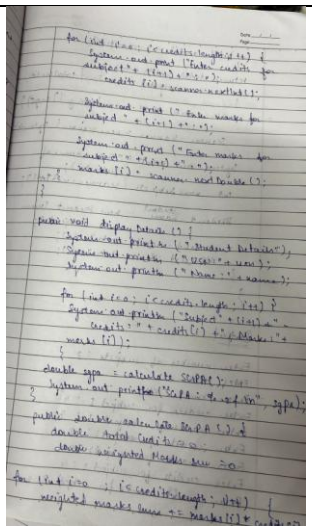


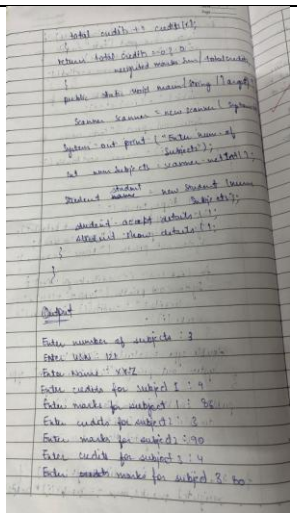
Program 2

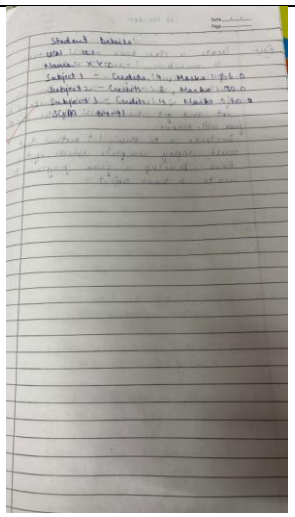
Student SGPA

Algorithm:









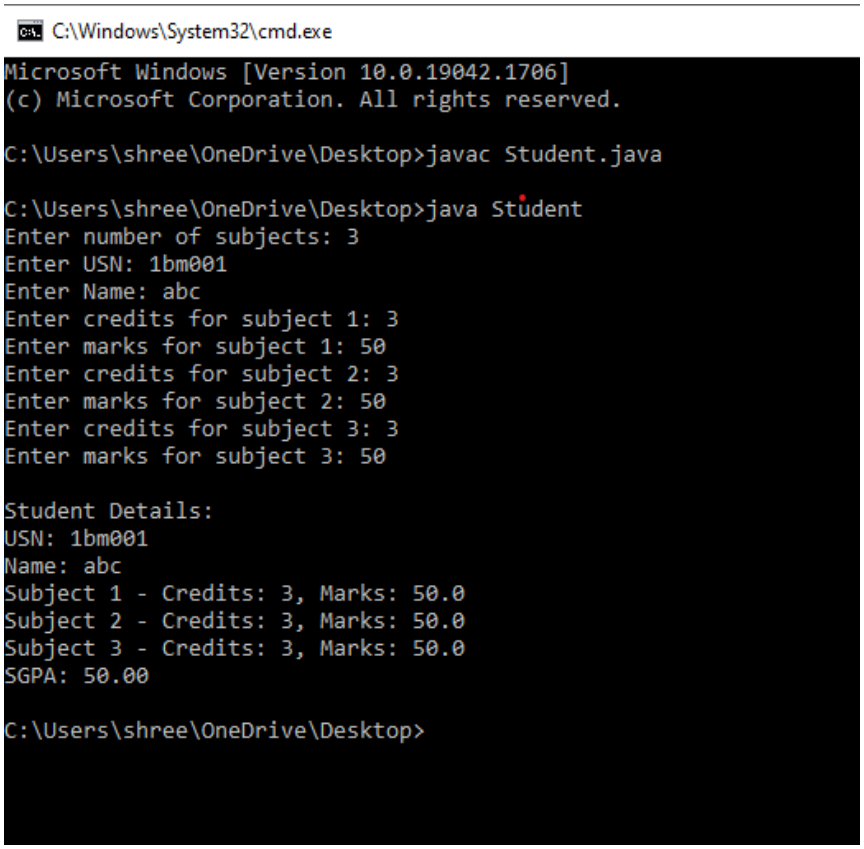
Code:

```
import java.util.Scanner;

class Subject {
    int grade;
    int credits;
}


class Student {
    String usn;
```

```
String name;
double SGPA;
Subject[] subjects;


Student() {
   subjects = new Subject[8];
   for (int i = 0; i < 8; i++) {
      subjects[i] = new Subject();
   }
}

void getDetails(Scanner sc) {
   System.out.println("Enter USN:");
   usn = sc.nextLine();
   System.out.println("Enter name:");
   name = sc.nextLine();
}

void getMarks(Scanner sc) {
   double totalScore = 0;
   int totalCredits = 0;

   System.out.println("Enter marks for 8 subjects:");
   for (int j = 0; j < 8; j++) {
      System.out.println("Enter marks for subject " + (j + 1) + ":");
      int marks = sc.nextInt();
      System.out.println("Enter the credits for subject " + (j + 1) + ":");
      int credits = sc.nextInt();

      int grade = (marks / 10) + 1;
      if (grade > 10) grade = 10;

      subjects[j].credits = credits;
      subjects[j].grade = grade;



      totalScore += grade * credits;
      totalCredits += credits;
   }
```

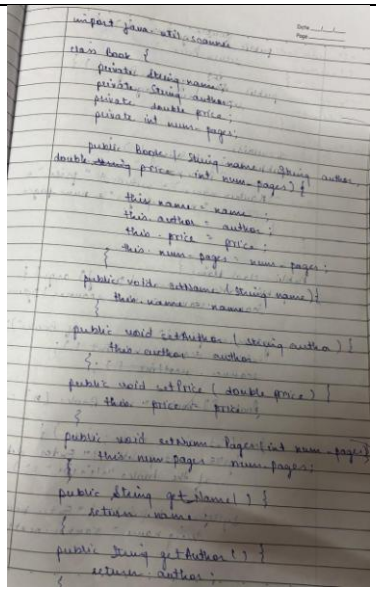
```
        SGPA = totalScore / totalCredits;
    }

    void displaySGPA() {
        System.out.println("SGPA of student " + name + " (" + usn + "): " + SGPA);
    }
}

public class StudentMains {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.println("Enter the number of students:");
        int numStudents = sc.nextInt();
        sc.nextLine();

        Student[] students = new Student[numStudents];

        for (int i = 0; i < numStudents; i++) {
            System.out.println("Entering details for student " + (i + 1));
            students[i] = new Student();
            students[i].getDetails(sc);
            students[i].getMarks(sc);
            students[i].displaySGPA();
        }

        sc.close();
    }
}
```

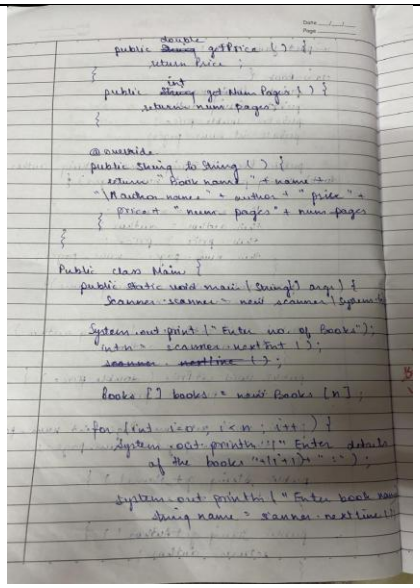
Output:

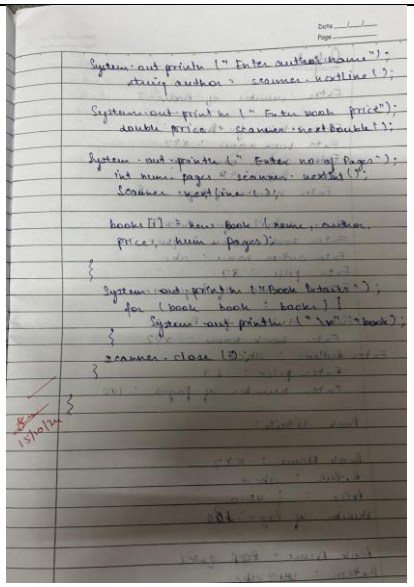

C:\Windows\System32\cmd.exe
Microsoft Windows [Version 10.0.19042.1706]
(c) Microsoft Corporation. All rights reserved.
C:\Users\shree\OneDrive\Desktop>javac Student.java
C:\Users\shree\OneDrive\Desktop>java Student
Enter number of subjects: 3
Enter USN: 1bm001
Enter Name: abc
Enter credits for subject 1: 3
Enter marks for subject 1: 50
Enter credits for subject 2: 3
Enter marks for subject 2: 50
Enter credits for subject 3: 3
Enter marks for subject 3: 50
Student Details:
USN: 1bm001
Name: abc
Subject 1 - Credits: 3, Marks: 50.0
Subject 2 - Credits: 3, Marks: 50.0
Subject 3 - Credits: 3, Marks: 50.0
SGPA: 50.00
C:\Users\shree\OneDrive\Desktop>

Program 3
Book Details

Algorithm:







Code:

```
import java.util.Scanner;
class Books{
 String name;
 String author;
 int price;
 int numPages;
 Books(String name, String author, int price, int numPages)

{
```

```
    this.name = name;
    this.author = author;
    this.price = price;
    this.numPages = numPages;

}

public String toString()

{

String name, author, price, numPages;

name = "Book name: " + this.name + "\n";

author = "Author name: " + this.author + "\n";

price = "Price: " + this.price + "\n";

numPages = "Number of pages: " + this.numPages + "\n";

return name + author + price + numPages;

}
}
class main{

public static void main(String args[])

{

  Scanner s = new Scanner(System.in);

 int n;
 int i;
 String name;
 String author;
 int price;
 int numPages;
 n=s.nextInt();
 Books b[];
 b=new Books[n];
```

```
 for(i=0;i<n;i++){
  System.out.println("enter book name");
  name = s.next();
  System.out.println("enter author name");
  author = s.next();
  System.out.println("enter the price");
  price=s.nextInt();
  System.out.println("enter number of pages");
  numPages = s.nextInt();
  b[i] = new Books(name,author,price,numPages);
}
 for(i=0;i<n;i++){
  System.out.println("Book Details");
  System.out.println(b[i].toString());
}
s.close();
}
}
```

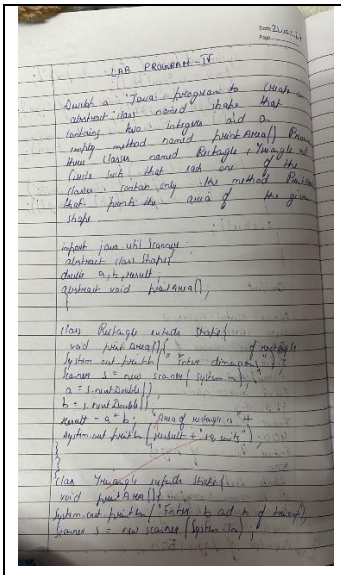
Output:

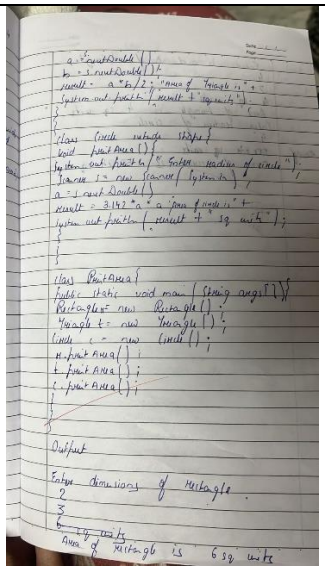
```
Enter the number of books: 3

Enter details for Book 1:
Enter book name: XYZ
Enter author name: abcd
Enter price: 45
Enter number of pages: 180

Enter details for Book 2:
Enter book name: qwer
Enter author name: abc
Enter price: 89
Enter number of pages: 100

Enter details for Book 3:
Enter book name: XYZ
Enter author name: abc
Enter price: 67
Enter number of pages: 100
```

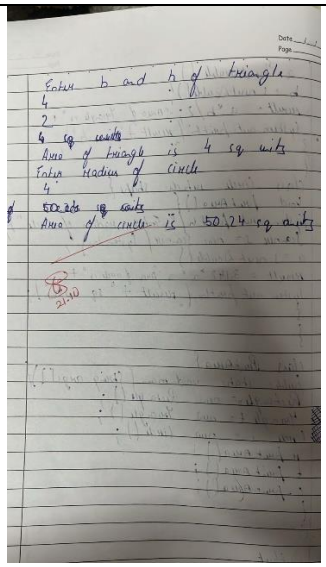
Program 4

Area of the Shape

Algorithm:







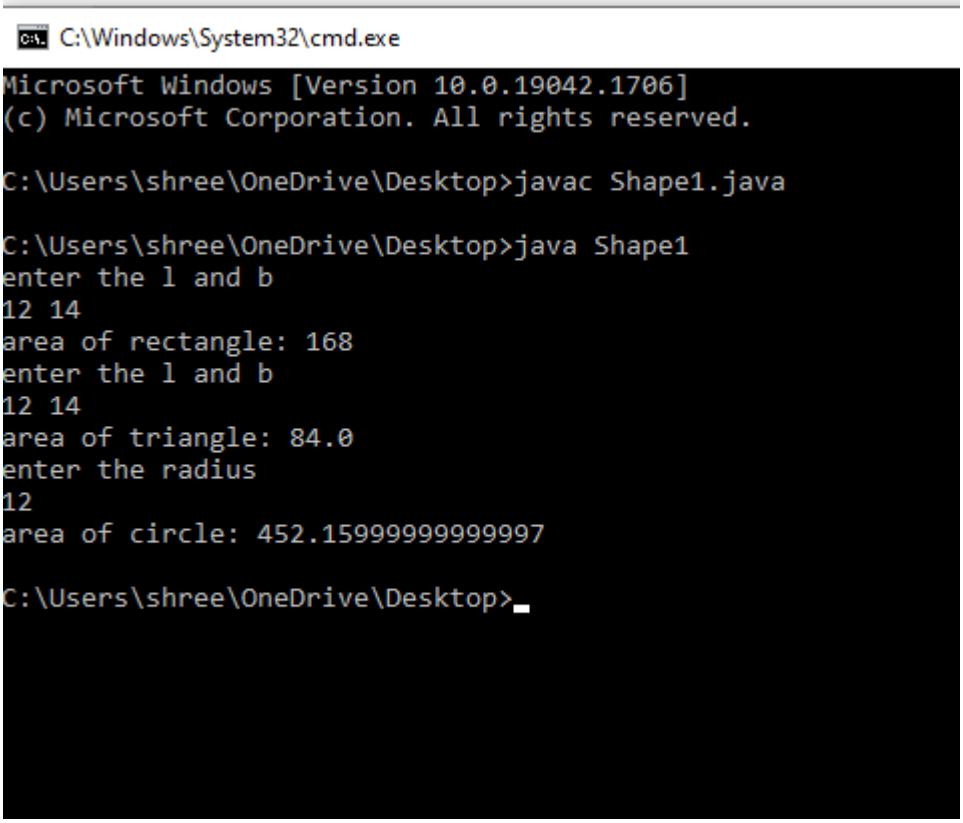
Code:

```
import java.util.Scanner;

abstract class shape{
    int dim1;
    int dim2;
```

```
    abstract void printarea();
}

class rectangle extends shape{
    public rectangle(){
    this.dim1=dim1;
    this.dim2=dim2;
    }
    public void printarea(){
      Scanner s = new Scanner(System.in);
      System.out.println("enter the l and b");
      dim1=s.nextInt();
      dim2=s.nextInt();

      int area=dim1*dim2;
      System.out.println("area of rectangle: "+area);
    }
}
class triangle extends shape{
    public triangle(){
    this.dim1=dim1;
    this.dim2=dim2;
    }
     public void printarea(){
      Scanner s = new Scanner(System.in);

       System.out.println("enter the l and b");
      dim1=s.nextInt();
      dim2=s.nextInt();
      double area=(dim1*dim2)/2;
      System.out.println("area of triangle: "+area);
    }

}
class circle extends shape{
    final double Pi=3.14;
    public circle(){
    this.dim1=dim1;
    }
    public void printarea(){
    Scanner s = new Scanner(System.in);
```

```
       System.out.println("enter the radius");
        dim1=s.nextInt();

        double area=Pi*dim1*dim1;
        System.out.println("area of circle: "+area);
      }
}
public class main{
  public static void main (String [] args){




     rectangle R =new rectangle();

     R.printarea();

     triangle T = new triangle();
     T.printarea();

     circle C = new circle();
    C.printarea();
    }

}
```

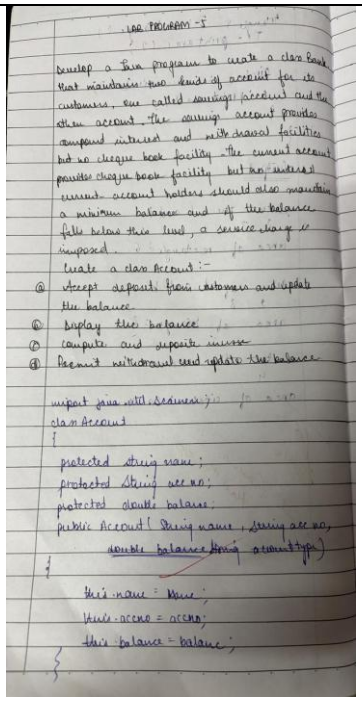
Output:

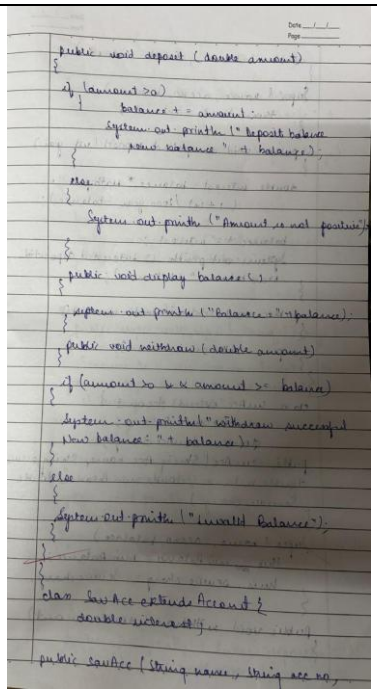

C:\Windows\System32\cmd.exe
Microsoft Windows [Version 10.0.19042.1706]
(c) Microsoft Corporation. All rights reserved.
C:\Users\shree\OneDrive\Desktop>javac Shape1.java
C:\Users\shree\OneDrive\Desktop>java Shape1
enter the l and b
12 14
area of rectangle: 168
enter the l and b
12 14
area of triangle: 84.0
enter the radius
12
area of circle: 452.15999999999997
C:\Users\shree\OneDrive\Desktop>

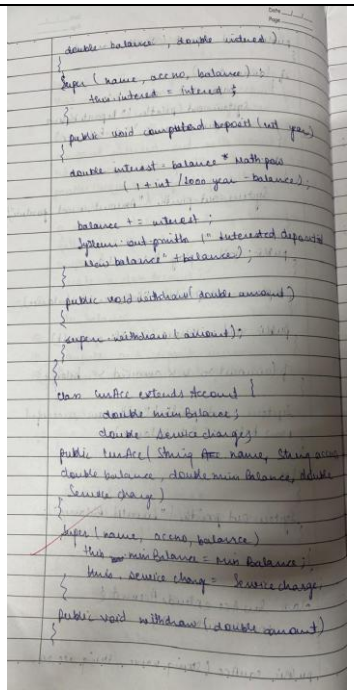
Program 5

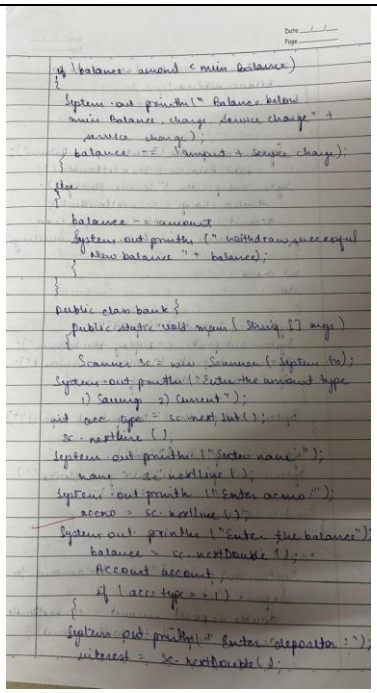
Bank

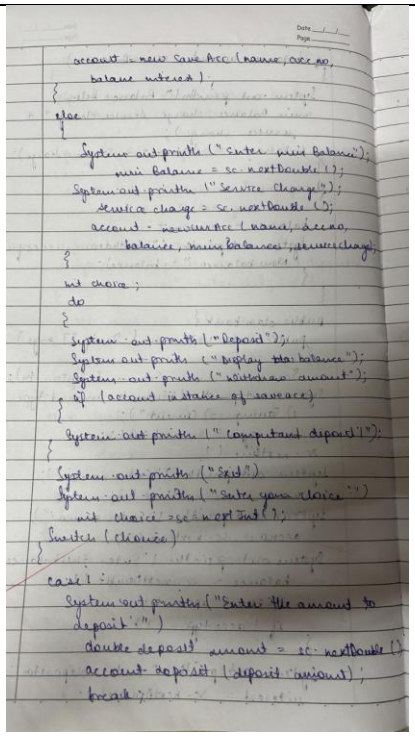
Algorithm:

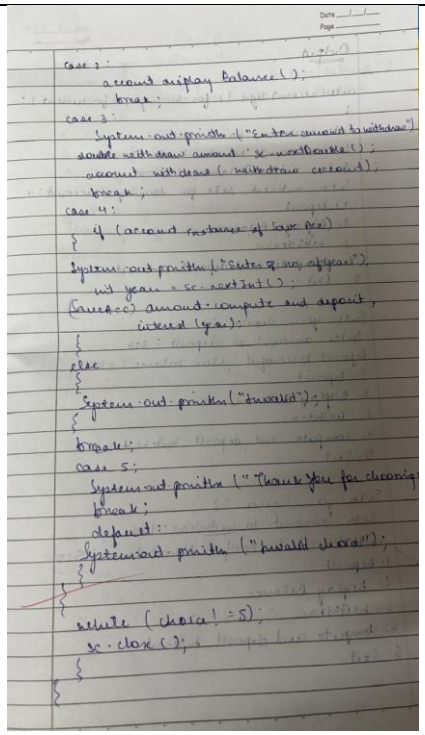












Code:

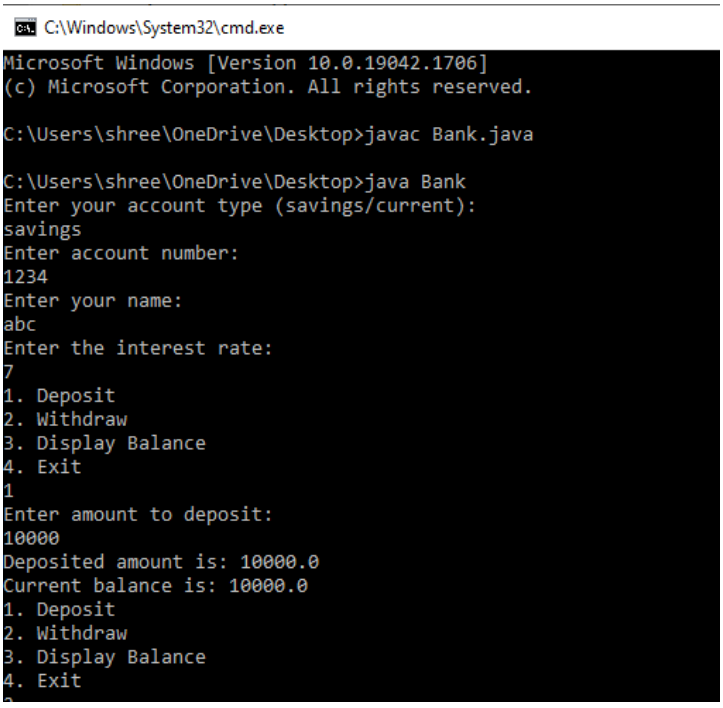
```
import java.util.Scanner;


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

    public Account(String customerName, String accountType, String accountNumber) {
        this.customerName = customerName;
        this.accountType = accountType;
```

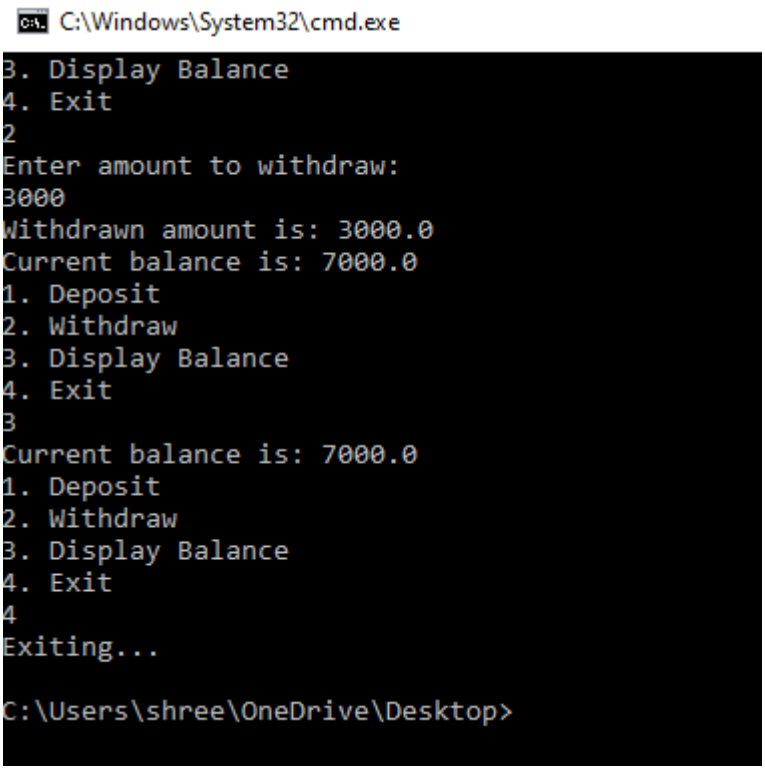
```
        this.accountNumber = accountNumber;
        this.balance = 0.0;
    }

    public void deposit(double amount) {
        balance += amount;
        System.out.println("Deposited amount is: " + amount);
        displayBalance();
    }

    public void displayBalance() {
        System.out.println("Current balance is: " + balance);
    }

    public abstract void withdraw(double amount);
}

class SavAcct extends Account {
    double interestRate;

    public SavAcct(String customerName, String accountNumber, double interestRate) {
        super(customerName, "savings", accountNumber);
        this.interestRate = interestRate;
    }

    public void compoundDeposit() {
        double interest = balance * (interestRate / 100);
        deposit(interest);
        System.out.println("Interest of " + interest + " deposited");
    }

    public void withdraw(double amount) {
        if (amount <= balance) {
            balance -= amount;
            System.out.println("Withdrawn amount is: " + amount);
        } else {
            System.out.println("Insufficient amount for withdrawal.");
            return;
        }
        displayBalance();
    }
}
```

```
class CurAcct extends Account {
    private static final double minBalance = 1000.0;
    private static final double serviceCharge = 50.0;

    public CurAcct(String customerName, String accountNumber) {
        super(customerName, "current", accountNumber);
    }

    public void withdraw(double amount) {
        if (amount <= balance) {
            balance -= amount;
            System.out.println("Withdrawn amount is: " + amount);
        } else {
            System.out.println("Insufficient amount for withdrawal.");
            return;
        }

        if (balance < minBalance) {
            balance -= serviceCharge;
            System.out.println("Minimum balance not maintained");
            System.out.println("Service charge of: " + serviceCharge + " included");
        }
        displayBalance();
    }
}

public class bank {
    public static void main(String[] args) {

        Scanner scanner = new Scanner(System.in);
        System.out.println("Enter your account type (savings/current):");
        String accountType = scanner.nextLine();
        System.out.println("Enter account number:");
        String accountNumber = scanner.nextLine();
        System.out.println("Enter your name:");
        String customerName = scanner.nextLine();

        Account account;
        if (accountType.equals("savings")) {
            System.out.println("Enter the interest rate:");
```

```
            double interestRate = scanner.nextDouble();
            account = new SavAcct(customerName, accountNumber, interestRate);
        } else {
            account = new CurAcct(customerName, accountNumber);
        }

        while (true) {
            System.out.println("1. Deposit\n2. Withdraw\n3. Display Balance\n4. Exit");
            int choice = scanner.nextInt();
            switch (choice) {
                case 1:
                    System.out.println("Enter amount to deposit:");
                    double depositAmount = scanner.nextDouble();
                    account.deposit(depositAmount);
                    break;
                case 2:
                    System.out.println("Enter amount to withdraw:");
                    double withdrawAmount = scanner.nextDouble();
                    account.withdraw(withdrawAmount);
                    break;
                case 3:
                    account.displayBalance();
                    break;
                case 4:
                    System.out.println("Exit");
                    scanner.close();
                    return;
                default:
                    System.out.println("Try again");
            }
        }
    }
}
```

Output:

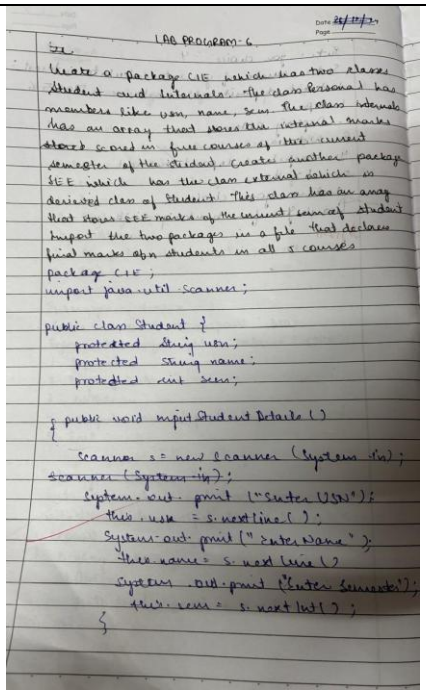

C:\Windows\System32\cmd.exe
Microsoft Windows [Version 10.0.19042.1706]
(c) Microsoft Corporation. All rights reserved.
C:\Users\shree\OneDrive\Desktop>javac Bank.java
C:\Users\shree\OneDrive\Desktop>java Bank
Enter your account type (savings/current):
savings
Enter account number:
1234
Enter your name:
abc
Enter the interest rate:
7
1. Deposit
2. Withdraw
3. Display Balance
4. Exit
1
Enter amount to deposit:
10000
Deposited amount is: 10000.0
Current balance is: 10000.0
1. Deposit
2. Withdraw
3. Display Balance
4. Exit


C:\Windows\System32\cmd.exe
3. Display Balance
4. Exit
2
Enter amount to withdraw:
3000
Withdrawn amount is: 3000.0
Current balance is: 7000.0
1. Deposit
2. Withdraw
3. Display Balance
4. Exit
3
Current balance is: 7000.0
1. Deposit
2. Withdraw
3. Display Balance
4. Exit
4
Exiting...
C:\Users\shree\OneDrive\Desktop>

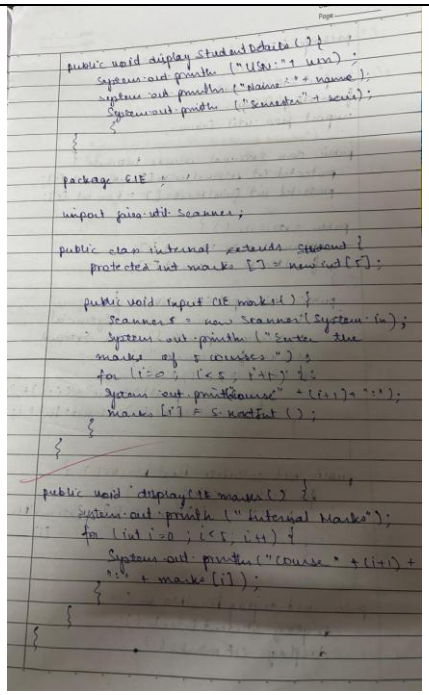
Program 6

Packages

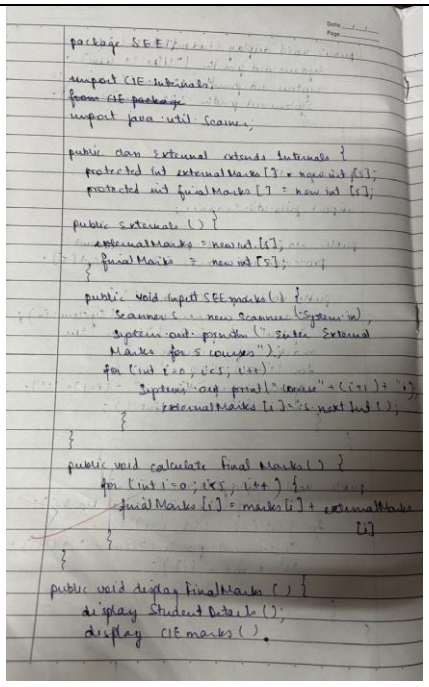
Algorithm:



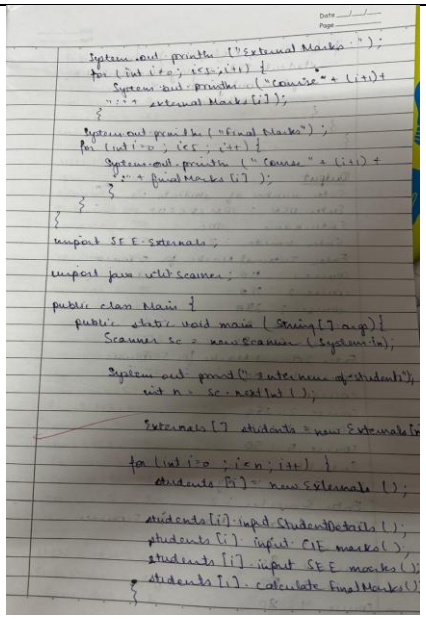
```
LAB PROGRAM-6

Q.
Create a package CIE which has two classes
Student and Internals. The class Personal has
members like usn, name, sem. The class internals
has an array that stores the internal marks
scored in five courses of the current
semester of the student. Create another package
SEE which has the class external which is
derived class of Student. This class has an array
that stores SEE marks of the current semester student.
Import the two packages in a file that declares
final marks of n students in all 5 courses

package CIE;
import java.util.Scanner;

public class Student {
    protected String usn;
    protected String name;
    protected int sem;

    public void inputStudentDetails()
    {
        Scanner s = new Scanner(System.in);
        Scanner(System.in);
        System.out.print("Enter USN:");
        this.usn = s.nextLine();
        System.out.print("Enter Name");
        this.name = s.nextLine()
        System.out.print("Enter Semester");
        this.sem = s.nextInt();
    }
```

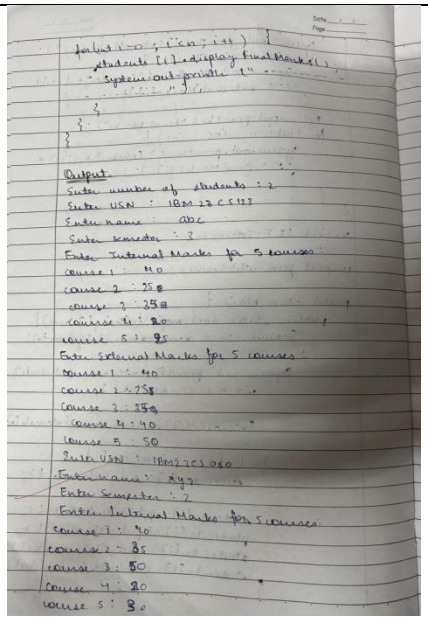


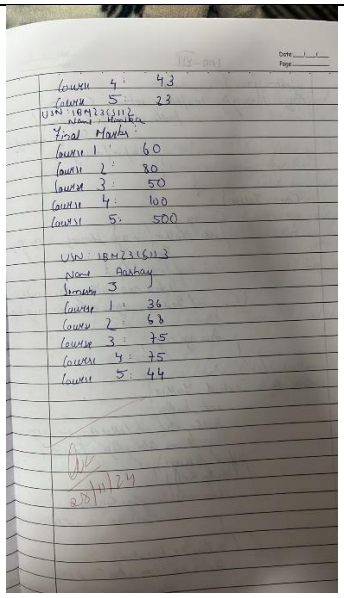
```
public void displayStudentDetails() {
    System.out.println("USN:" + usn);
    System.out.println("Name:" + name);
    System.out.println("Semester" + sem);
    }

package CIE;

import java.util.Scanner;

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

    public void inputCIEmarks() {
        Scanner s = new Scanner(System.in);
        System.out.println("Enter the
        marks of 5 courses");
        for(i=0; i<5; i++) {
        System.out.println("Course" + (i+1) + ":");
        marks[i] = s.nextInt();
        }
    }

public void displayCIEmarks() {
    System.out.println("Internal Marks");
    for(int i=0; i<5; i++) {
        System.out.println("Course" + (i+1) +
        ":" + marks[i]);
    }
}
```



```
package SEE;

import CIE.Internals;
from CIE package
import java.util.Scanner;

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

    public External() {
        externalMarks = new int[5];
        finalMarks = new int[5];
    }
    public void inputSEEmarks() {
        Scanner s = new Scanner(System.in);
        System.out.println("Enter External
        Marks for 5 courses");
        for(int i=0; i<5; i++)
            System.out.println("course" + (i+1) + ":");
            externalMarks[i] = s.nextInt();
        }
    }
    public void calculateFinalMarks() {
        for(int i=0; i<5; i++) {
            finalMarks[i] = marks[i] + externalMarks
                                        [i]
        }
    }
public void displayFinalMarks() {
    displayStudentDetails();
    displayCIEmarks();
```







Code: CIE

Internals.java

```
package CIE;

import java.util.Scanner;

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

    public void inputCIEmarks() {
Scanner s = new Scanner(System.in);
        System.out.println("Enter Internal Marks for 5 courses: ");
        for (int i = 0; i < 5; i++) {
            System.out.print("Course " + (i + 1) + ": ");
marks[i] = s.nextInt();
        }
    }

    public void displayCIEmarks() {
System.out.println("Internal Marks: ");
        for (int i = 0; i < 5; i++) {
            System.out.println("Course " + (i + 1) + ": " + marks[i]);
```

```
        }
    }
}
```

Student.java

```
package CIE;

import java.util.Scanner;

public class Student {
  protected String usn;
protected String name;
    protected int sem;

    public void inputStudentDetails() {
Scanner s = new Scanner(System.in);
System.out.print("Enter USN: ");
this.usn = s.nextLine();
System.out.print("Enter Name: ");
this.name = s.nextLine();
System.out.print("Enter Semester: ");
        this.sem = s.nextInt();
    }
    public void displayStudentDetails() {
System.out.println("USN: " + usn);
        System.out.println("Name: " + name);
        System.out.println("Semester: " + sem);
    }
}
```

SEE:

Student.java

```
package SEE;

import CIE.Internals;
import java.util.Scanner;

public class Externals extends Internals {
protected int externalMarks[] = new int[5];
protected int finalMarks[] = new int[5];
```

```
public Externals() {        externalMarks =
new int[5];
        finalMarks = new int[5];
    }
    public void inputSEEmarks() {
Scanner s = new Scanner(System.in);
        System.out.println("Enter External Marks for 5 courses: ");
        for (int i = 0; i < 5; i++) {
            System.out.print("Course " + (i + 1) + ": ");
externalMarks[i] = s.nextInt();
        }
    }
    public void calculateFinalMarks() {
for (int i = 0; i < 5; i++) {
            finalMarks[i] = marks[i] + externalMarks[i];
        }
}
    public void displayFinalMarks() {
displayStudentDetails();
        displayCIEmarks();

        System.out.println("External Marks: ");
        for (int i = 0; i < 5; i++) {
            System.out.println("Course " + (i + 1) + ": " + externalMarks[i]);
        }

        System.out.println("Final Marks: ");
for (int i = 0; i < 5; i++) {
            System.out.println("Course " + (i + 1) + ": " + finalMarks[i]);
        }
    }
}
```

Main.java

```
import SEE.Externals;

import java.util.Scanner;

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

```
        System.out.print("Enter number of students: ");
        int n = sc.nextInt();

        Externals[] students = new Externals[n];

        for (int i = 0; i < n; i++) {
students[i] = new Externals();
students[i].inputStudentDetails();
students[i].inputCIEmarks();
students[i].inputSEEmarks();
            students[i].calculateFinalMarks();
        }
                for (int i = 0; i < n; i++) {
students[i].displayFinalMarks();
            System.out.println("----------");
}
    }
}
```

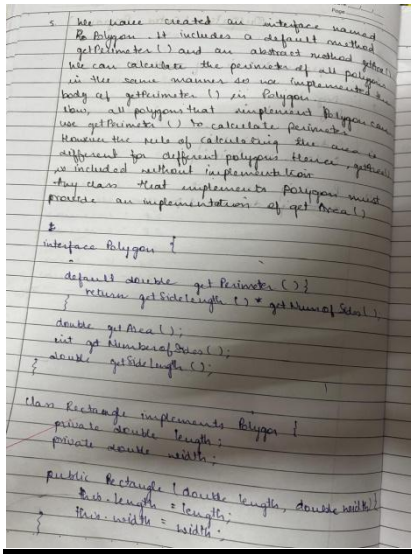
Output:

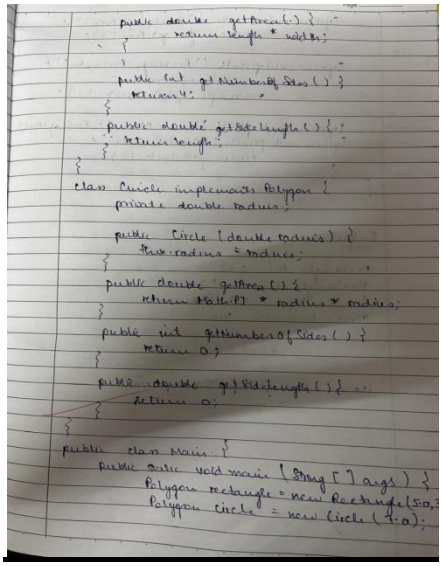
```
C:\Users\STUDENT\Desktop\1BMK>javac -d . CIE/Student.java

C:\Users\STUDENT\Desktop\1BMK>javac -d . CIE/Internals.java

C:\Users\STUDENT\Desktop\1BMK>javac -d . SEE/Externals.java

C:\Users\STUDENT\Desktop\1BMK>javac Main.java

C:\Users\STUDENT\Desktop\1BMK>java Main
Enter number of students: 2
Enter USN: 1bm23cs121
Enter Name: himika
Enter Semester: 3
Enter Internal Marks for 5 courses:
Course 1: 30
Course 2: 40
Course 3: 20
Course 4: 50
Course 5: 30
Enter External Marks for 5 courses:
Course 1: 30
Course 2: 40
Course 3: 30
Course 4: 50
Course 5: 20
Enter USN: 1bm23cs122
Enter Name: chiraiya
Enter Semester: 2
Enter Internal Marks for 5 courses:
Course 1: 12
Course 2: 23
Course 3: 43
Course 4: 32
Course 5: 21
Enter External Marks for 5 courses:
Course 1: 24
Course 2: 45
Course 3: 32
Course 4: 43
Course 5: 23
USN: 1bm23cs121
Name: himika
Semester: 3
Internal Marks:
Course 1: 30
Course 2: 40
Course 3: 20
Course 4: 50
Course 5: 21
Enter External Marks for 5 courses:
Course 1: 24
Course 2: 45
Course 3: 32
Course 4: 43
Course 5: 23
USN: 1bm23cs121
Name: himika
Semester: 3
Internal Marks:
Course 1: 30
Course 2: 40
Course 3: 20
Course 4: 50
Course 5: 30
External Marks:
Course 1: 30
Course 2: 40
Course 3: 30
Course 4: 50
Course 5: 20
Final Marks:
Course 1: 60
Course 2: 80
Course 3: 50
Course 4: 100
Course 5: 50
-------------------------------------------
USN: 1bm23cs122
Name: chiraiya
Semester: 2
Internal Marks:
Course 1: 12
Course 2: 23
Course 3: 43
Course 4: 32
Course 5: 21
External Marks:
Course 1: 24
Course 2: 45
Course 3: 32
Course 4: 43
Course 5: 23
Final Marks:
Course 1: 36
Course 2: 68
Course 3: 75
Course 4: 75
Course 5: 44
-------------------------------------------
```

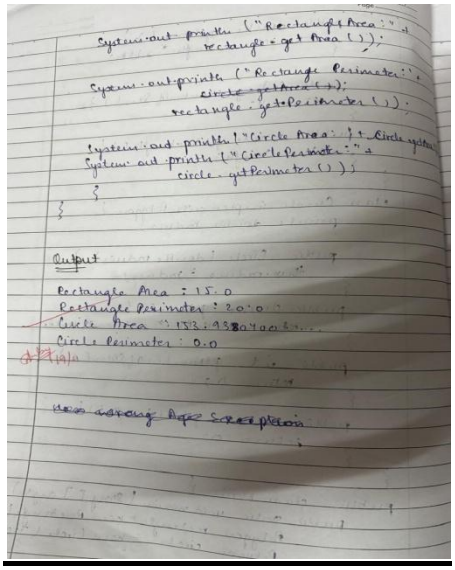
Program

Interfaces

Algorithm:







Code:

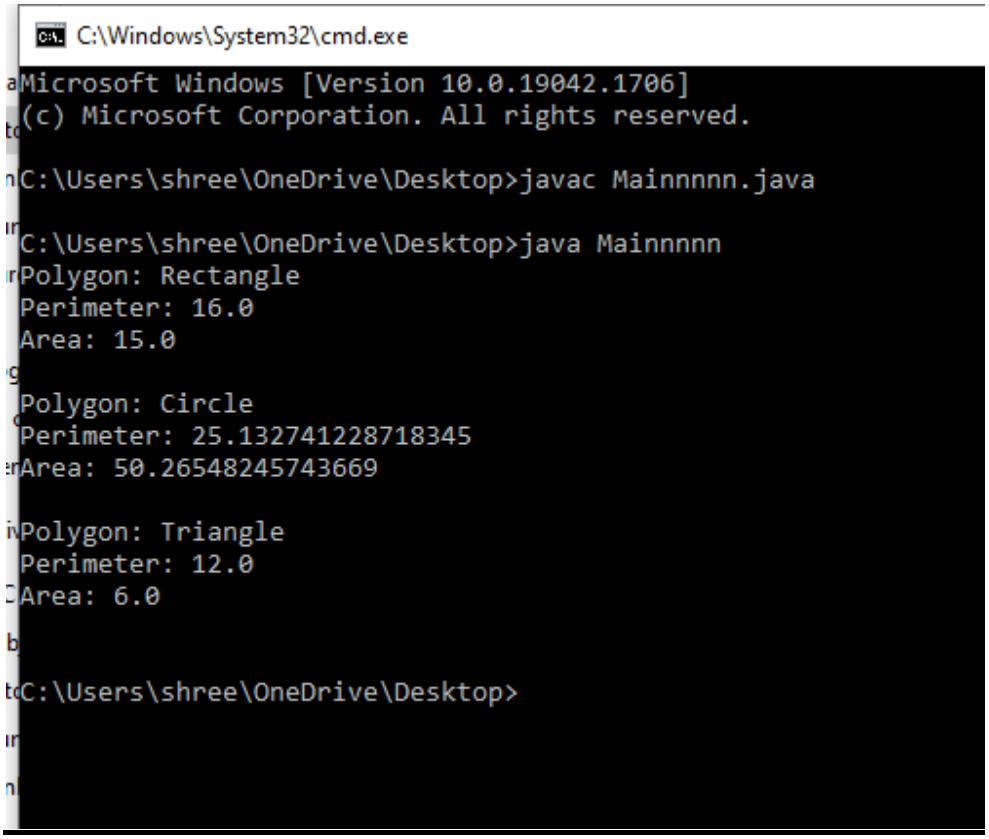
```
interface Polygon {

    default double getPerimeter() {
        return 0.0;
    }


    double getArea();
}


class Rectangle implements Polygon {
    private double length;
    private double width;


    public Rectangle(double length, double width) {
```

```
        this.length = length;
        this.width = width;
    }


    @Override
    public double getArea() {
        return length * width;
    }


    @Override
    public double getPerimeter() {
        return 2 * (length + width);
    }
}


class Circle implements Polygon {
    private double radius;


    public Circle(double radius) {
        this.radius = radius;
    }


    @Override
    public double getArea() {
        return Math.PI * radius * radius;
    }


    @Override
    public double getPerimeter() {
        return 2 * Math.PI * radius;
    }
```

```
}

class Triangle implements Polygon {
    private double side1, side2, side3;


    public Triangle(double side1, double side2, double side3) {
        this.side1 = side1;
        this.side2 = side2;
        this.side3 = side3;
    }


    @Override
    public double getArea() {
        double s = (side1 + side2 + side3) / 2;
        return Math.sqrt(s * (s - side1) * (s - side2) * (s - side3));
    }


    @Override
    public double getPerimeter() {
        return side1 + side2 + side3;
    }
}

public class Mainnnnn {
    public static void main(String[] args) {

        Polygon[] polygons = {
            new Rectangle(5, 3),
            new Circle(4),
            new Triangle(3, 4, 5)
        };


        for (Polygon polygon : polygons) {
```

```
            System.out.println("Polygon: " + polygon.getClass().getSimpleName());
            System.out.println("Perimeter: " + polygon.getPerimeter());
            System.out.println("Area: " + polygon.getArea());
            System.out.println();
        }
    }
}
```

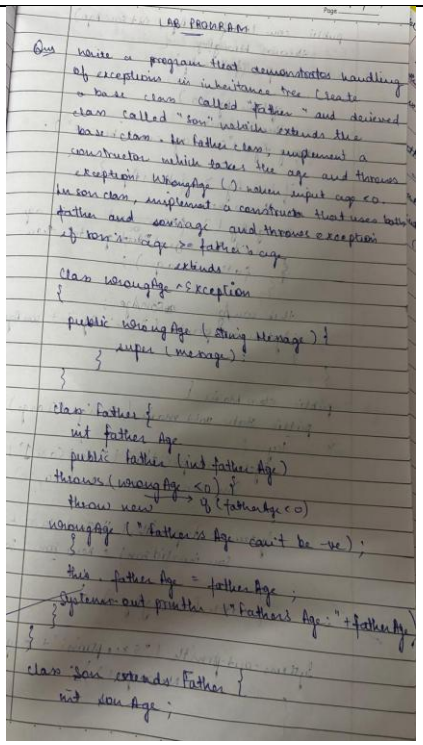
Output:

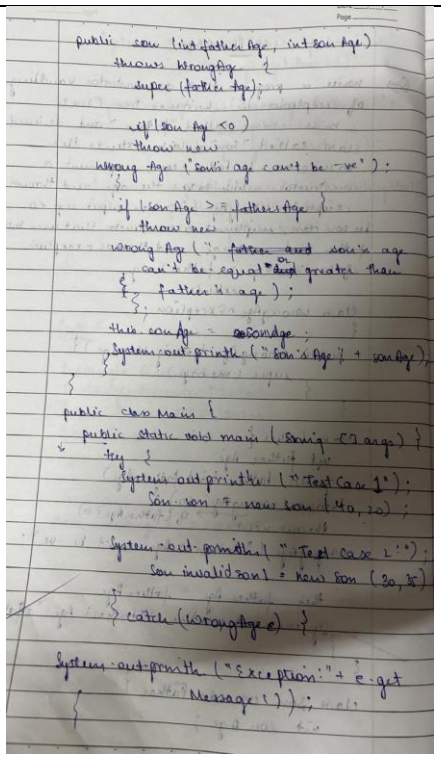


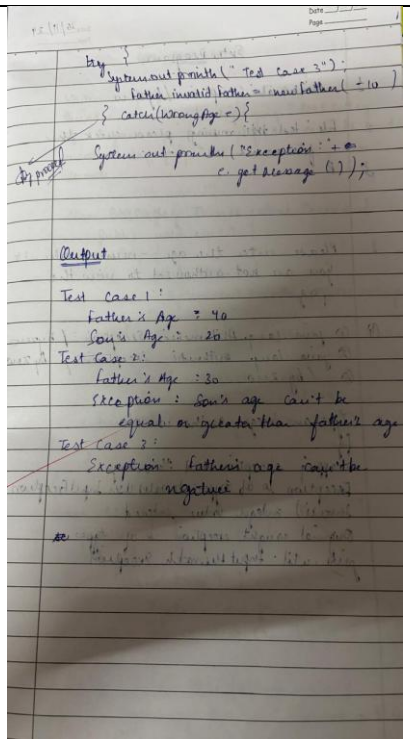
Program 7

Exception Handling Inheritance

Algorithm:







Code:

```
import java.util.Scanner;

class WrongAgeException extends Exception {
    public WrongAgeException(String message) {
        super(message);
    }
}

class Father {
```

```
    int age;

    public Father(int age) throws WrongAgeException {
        if (age < 0) {
            throw new WrongAgeException("Father's age cannot be negative.");
        }
        this.age = age;
    }
}
class Son extends Father {
    int sonAge;

    public Son(int fatherAge, int sonAge) throws WrongAgeException {
        super(fatherAge);
        if (sonAge < 0) {
            throw new WrongAgeException("Son's age cannot be negative.");
        }
        if (sonAge >= fatherAge) {
            throw new WrongAgeException("Son's age cannot be greater than or equal to Father's age.");
        }
        this.sonAge = sonAge;
    }
}

public class ExceptionHandlingInheritance {
    public static 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();
```

```
            Son son = new Son(fatherAge, sonAge);
            System.out.println("Father's age: " + son.age);
            System.out.println("Son's age: " + son.sonAge);

        } catch (WrongAgeException e) {
            System.out.println("Error: " + e.getMessage());
        } catch (Exception e) {
            System.out.println("Unexpected error: " + e.getMessage());
        } finally {
            scanner.close();
        }
    }
}
```

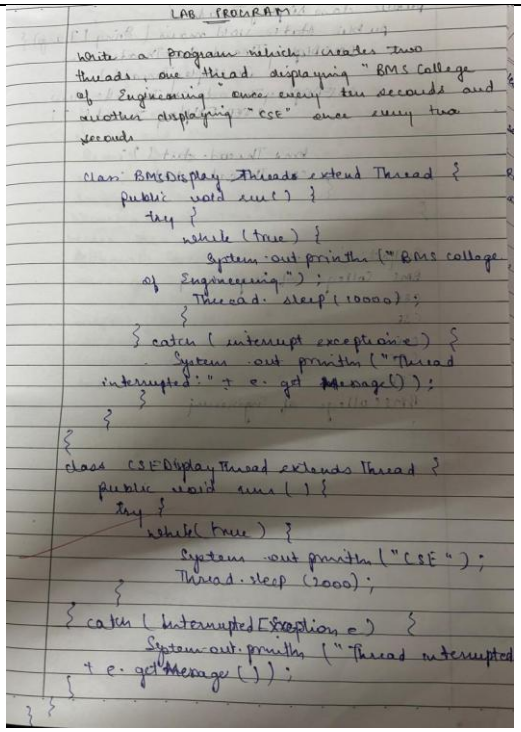
Output:

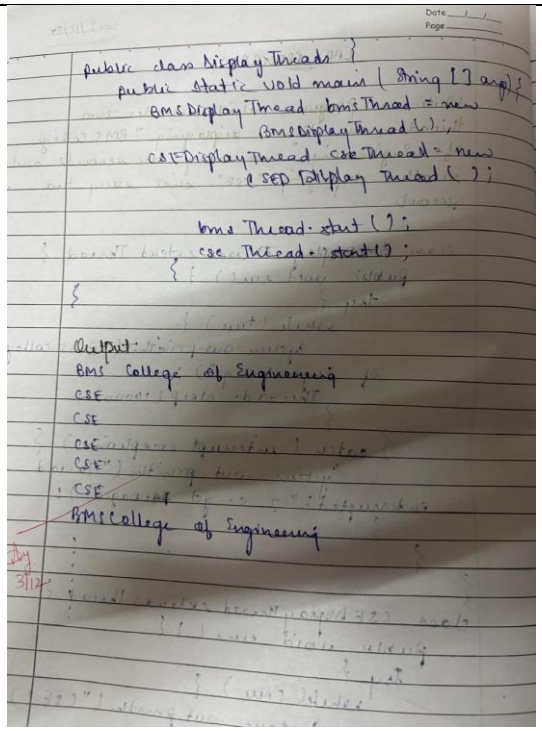
```
Microsoft Windows [Version 10.0.22631.4317]
(c) Microsoft Corporation. All rights reserved.

C:\Users\91889\OneDrive\Desktop\BMS PDF>javac ExceptionHandlingInheritance.java

C:\Users\91889\OneDrive\Desktop\BMS PDF>java ExceptionHandlingInheritance
Enter Father's age: 18
Enter Son's age: 5
Father's age: 18
Son's age: 5

C:\Users\91889\OneDrive\Desktop\BMS PDF>15
'15' is not recognized as an internal or external command,
operable program or batch file.

C:\Users\91889\OneDrive\Desktop\BMS PDF>javac ExceptionHandlingInheritance.java

C:\Users\91889\OneDrive\Desktop\BMS PDF>java ExceptionHandlingInheritance
Enter Father's age: 15
Enter Son's age: 16
Error: Son's age cannot be greater than or equal to Father's age.
```

Program 8

Threads

Algorithm:



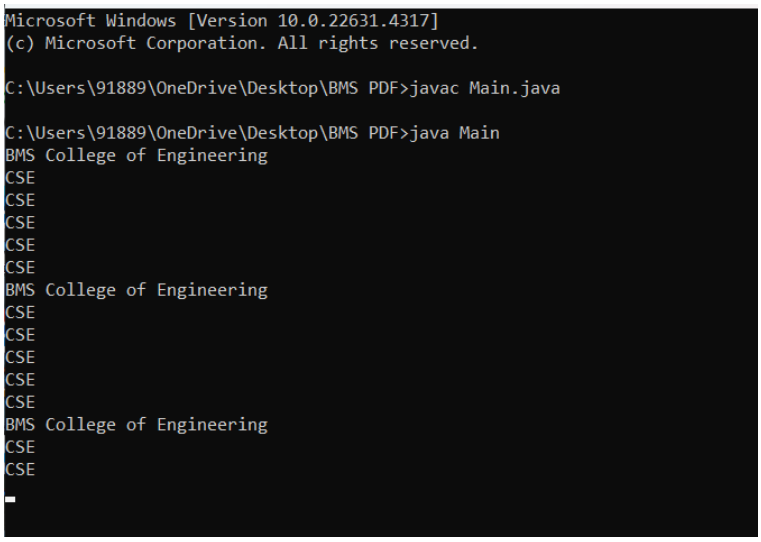


Code:

```
public class Main {
    static class BMSDisplayThread extends Thread {
        public void run() {
            while (true) {
                System.out.println("BMS College of Engineering");
                try {
                    Thread.sleep(10000);
                } catch (InterruptedException e) {
                    e.printStackTrace();
                }
            }
        }
```

```
    }

    static class CSEDisplayThread extends Thread {
        public void run() {
            while (true) {
                System.out.println("CSE");
                try {
                    Thread.sleep(2000);
                } catch (InterruptedException e) {
                    e.printStackTrace();
                }
            }
        }
    }

    public static void main(String[] args) {
        Thread bmsThread = new BMSDisplayThread();
        Thread cseThread = new CSEDisplayThread();

        bmsThread.start();
        cseThread.start();
    }
}
```

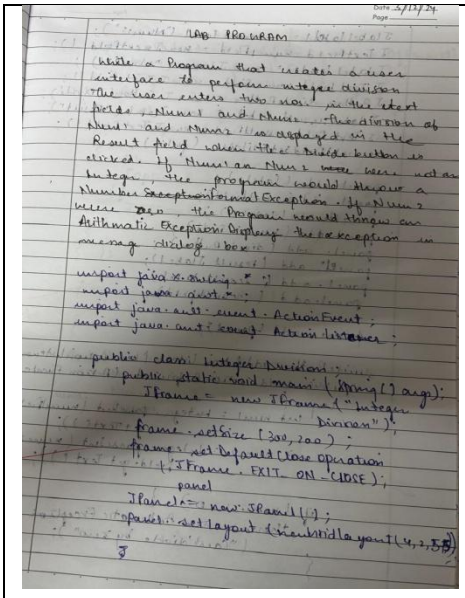
Output:

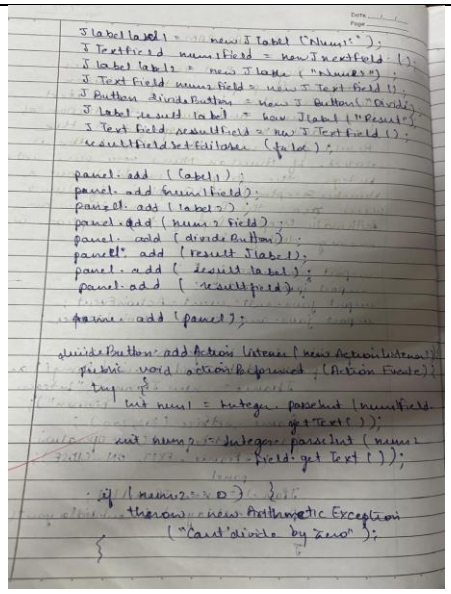


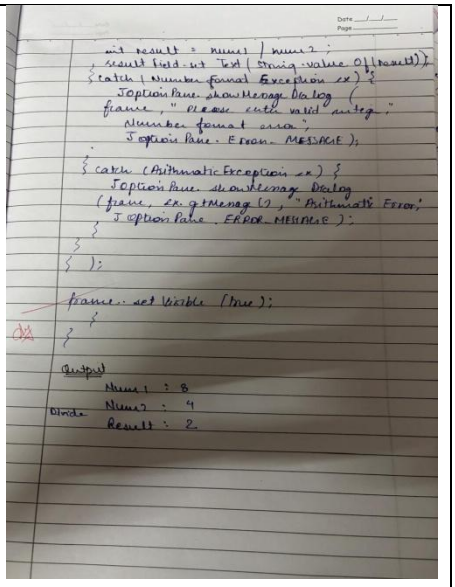
Program 9

Swing Demo

Algorithm:







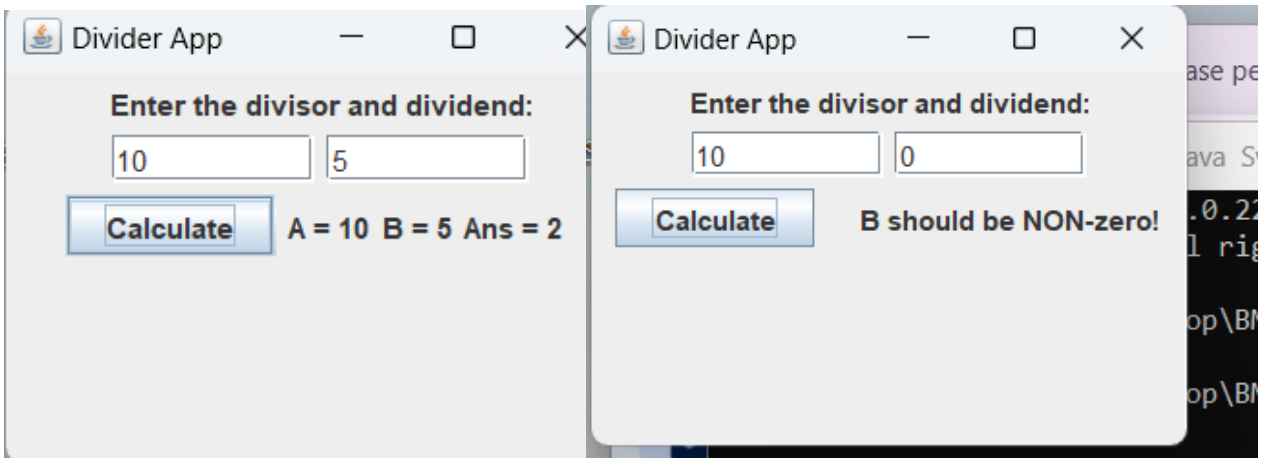
Code:

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

class SwingDemo {
    SwingDemo() {

        JFrame jfrm = new JFrame("Divider App");
        jfrm.setSize(275, 200);
        jfrm.setLayout(new FlowLayout());
```

```
jfrm.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);

JLabel jlab = new JLabel("Enter the divisor and dividend:");

JTextField ajtf = new JTextField(8);
JTextField bjtf = new JTextField(8);

JButton button = new JButton("Calculate");

JLabel err = new JLabel();
JLabel alab = new JLabel();
JLabel blab = new JLabel();
JLabel anslab = new JLabel();
jfrm.add(jlab);
jfrm.add(ajtf);
jfrm.add(bjtf);
jfrm.add(button);
jfrm.add(alab);
jfrm.add(blab);
jfrm.add(anslab);
jfrm.add(err);
button.addActionListener(new ActionListener() {
   public void actionPerformed(ActionEvent evt) {
      try {
         int a = Integer.parseInt(ajtf.getText());
         int b = Integer.parseInt(bjtf.getText());

         int ans = a / b;
         alab.setText("A = " + a);
         blab.setText("B = " + b);
```

```
                anslab.setText("Ans = " + ans);
                err.setText("");
            } catch (NumberFormatException e) {
                alab.setText("");
                blab.setText("");
                anslab.setText("");
                err.setText("Enter Only Integers!");
            } catch (ArithmeticException e) {
                alab.setText("");
                blab.setText("");
                anslab.setText("");
                err.setText("B should be NON-zero!");
            }
        }
    });
    jfrm.setVisible(true);
  }

  public static void main(String[] args) {
    SwingUtilities.invokeLater(new Runnable() {
      public void run() {
        new SwingDemo();
      }
    });
  }
}
```

Output:


Divider App
Enter the divisor and dividend:
10
5
Calculate
A = 10 B = 5 Ans = 2
Divider App
Enter the divisor and dividend:
10
0
Calculate
B should be NON-zero!