VISVESVARAYA TECHNOLOGICAL UNIVERSITY

“JnanaSangama”, Belgaum -590014, Karnataka.

LAB REPORT
on

Object Oriented Java Programming

(23CS3PCOOJ)

Submitted by

MAHESHA G S (24BECS429)

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 **Mahesha G S(24BECS429),** 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.

Srushti C S Assistant Professor Department of CSE, BMSCE	Dr. Jyothi S Nayak Professor & HOD Department of CSE, BMSCE

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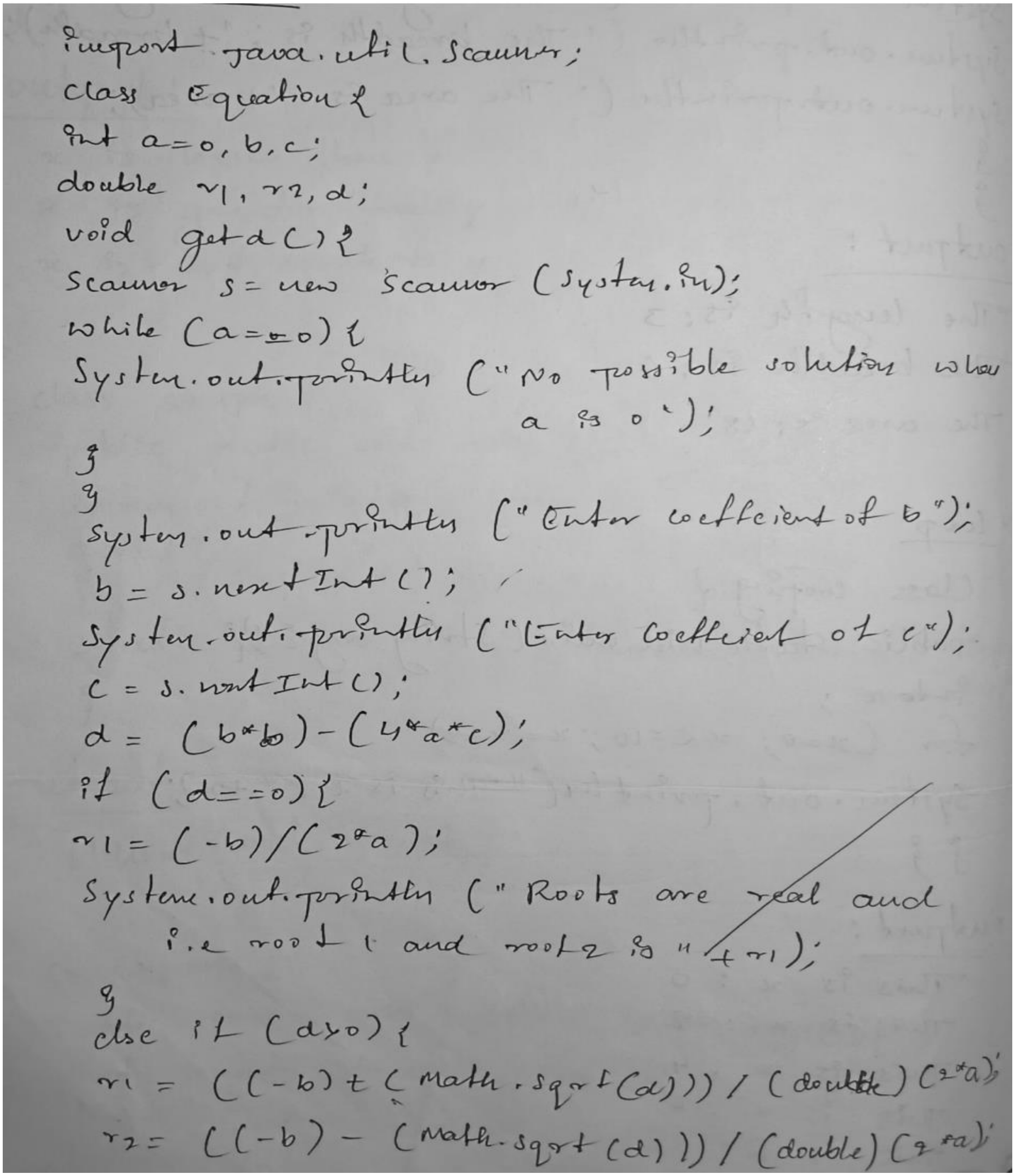
Github Link:
https://github.com/maheshags/java-lab-programs

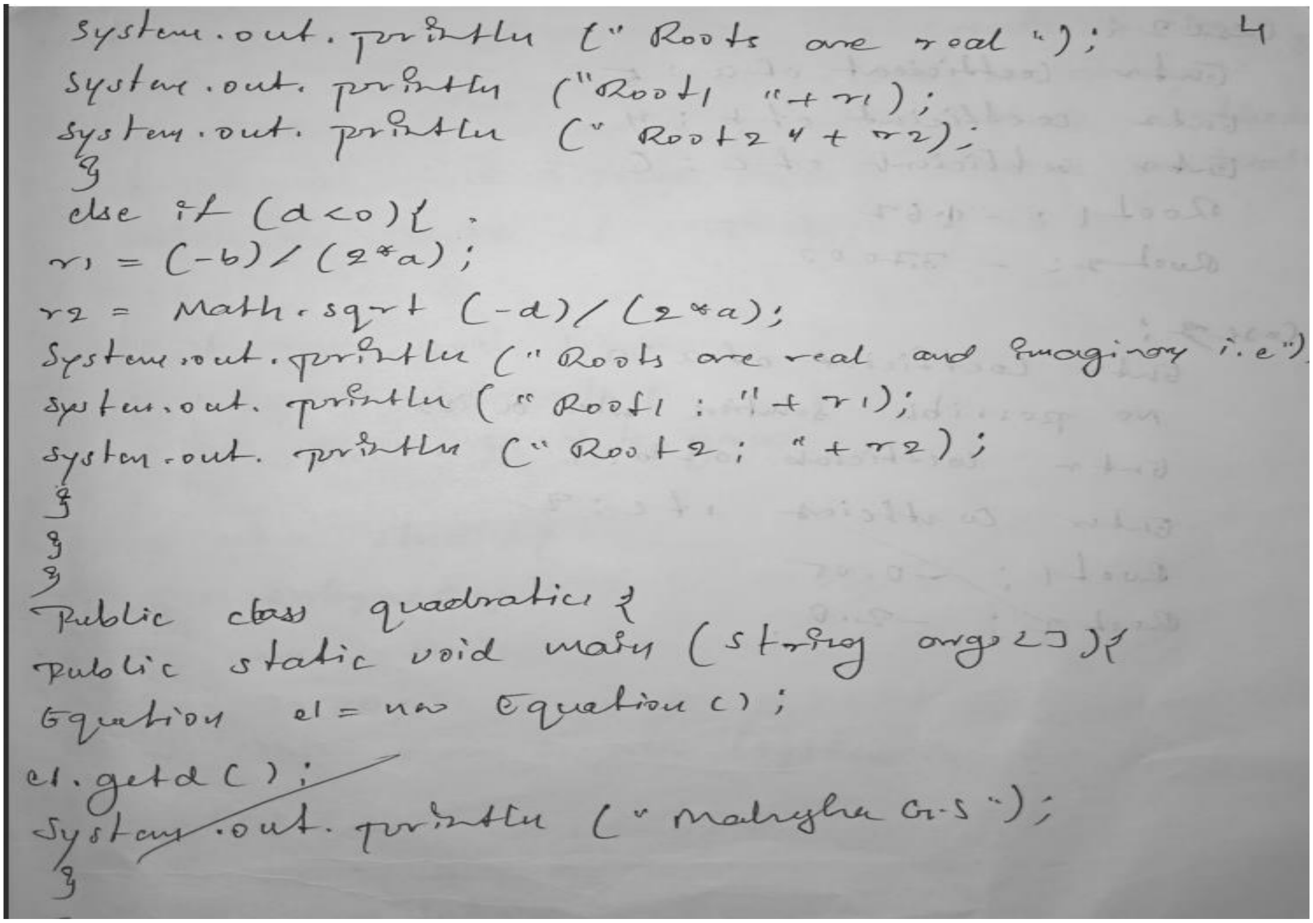
PROGRAM NO-1

Implement Quadratic Equation

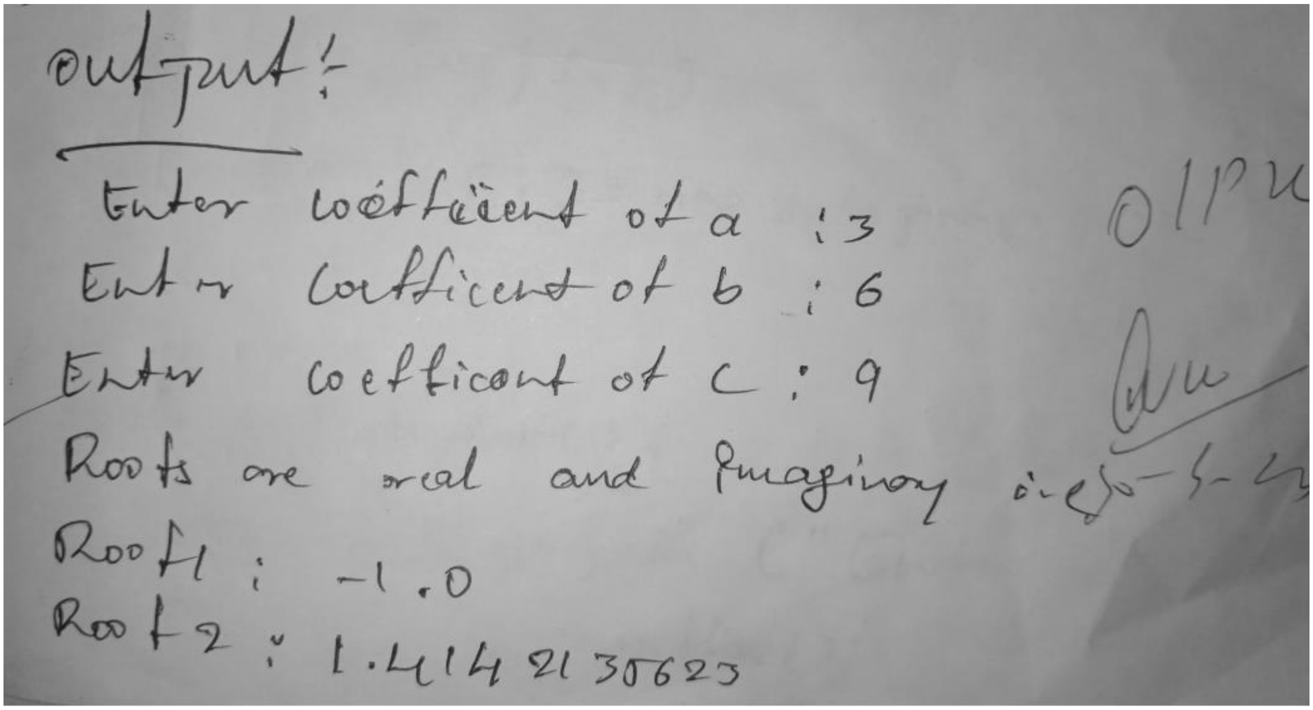
Algorithm:



```
import java.util.Scanner;
class Equation {
int a=0, b,c;
double r1, r2, d;
void getd() {
Scanner s = new Scanner (System.in);
while (a==0) {
System.out.println ("No possible solution when
                    a is 0");
}
}
System.out.println ("Enter coeffcient of b");
b = s.nextInt();
System.out.println ("Enter Coeffciet of c");
c = s.nxtInt();
d = (b*b)-(4*a*c);
if (d==0) {
r1 = (-b)/(2*a);
Systeme.out.println (" Roots are real and
      i.e root 1 and root2 is " +r1);
}
else if (d>0) {
r1 = ((-b) + (Math.sqrt(d))) / (double) (2*a);
r2 = ((-b) - (Math.sqrt(d))) / (double) (2*a);
```



```
system.out.println (" Roots are real ");                4
system.out.println ("Root1 "+r1);
system.out.println (" Root2 "+ r2);
}
else if (d<0){
r1 = (-b)/(2*a);
r2 = Math.sqrt (-d)/(2*a);
System.out.println (" Roots are real and imaginary i.e")
system.out.println (" Root1 : "+ r1);
system.out.println (" Root2 ; "+ r2);
}
}
}
Public class quadratic {
Public static void main (String args[]){
Equation e1 = new Equation ();
e1.getd ();
System.out.println (" Malegha G.S ");
}
```



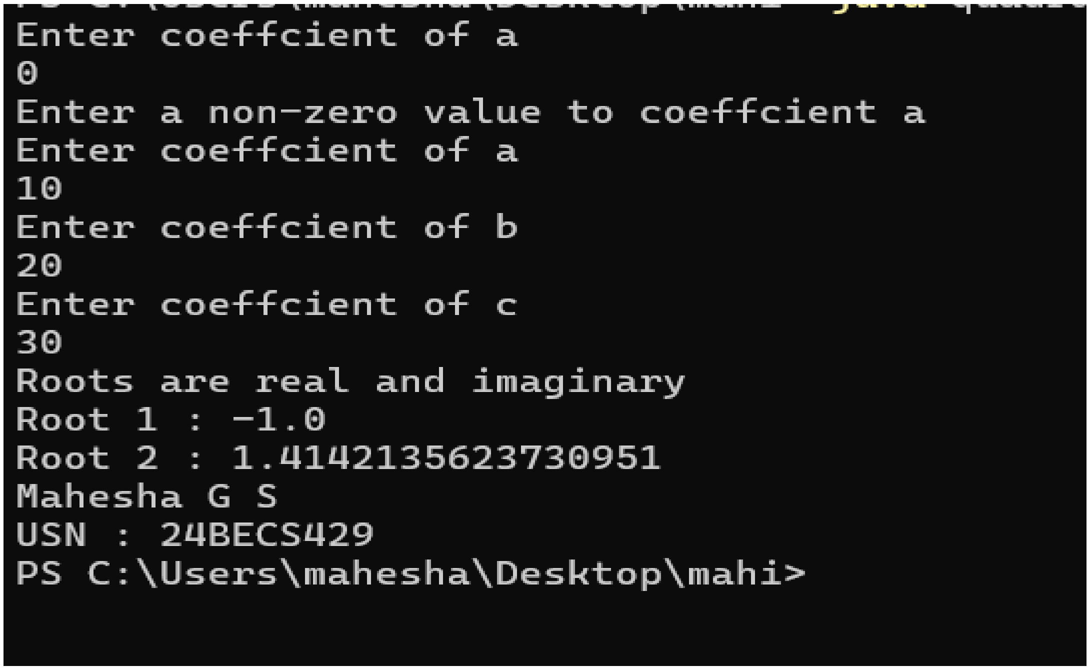
output:-

```
Enter coefficent of a : 3                      O/P
Enter Coefficent of b : 6
Enter coefficent of c : 9
Roots are real and Imaginary i.e
Root1 : -1.0
Root2 : 1.4142135623
```

CODE:

```
import java.util.*;
class Equation{
int a,b,c;
double r1,r2,d;

void getd()
{
Scanner input=new Scanner(System.in);
while (a==0){
System.out.println("Enter coeffcient of a");
a=input.nextInt();
if (a==0){
System.out.println("Enter a non-zero value to coeffcient a");
}
}
System.out.println("Enter coeffcient of b");
b=input.nextInt();
System.out.println("Enter coeffcient of c");
c=input.nextInt();
d=(b*b)-(4*a*c);
if (d==0)
{
r1=(-b)/(2*a);
System.out.println("Roots are real and equal  root 1 and root 2 is"+ r1);
}
else if (d>0)
{
r1=((-b) + (Math.sqrt(d)))/(double)(2*a);
r2=((-b) - (Math.sqrt(d)))/(double)(2*a);
System.out.println("Roots are real ");
System.out.println("Root 1 "+r1);
System.out.println("Root 2 "+r2);
}
else if(d<0)
{
r1=(-b)/(2*a);
r2 = Math.sqrt(-d)/(2*a);
System.out.println("Roots are real and imaginary  ");
System.out.println("Root 1 : "+ r1);
System.out.println("Root 2 : "+ r2);
}
}
}

public class quadratic1{
public static void main(String args[]){
Equation equation1=new Equation();
equation1.getd();
System.out.println("Mahesha G S");
System.out.println("USN : 24BECS429");
}
}
```

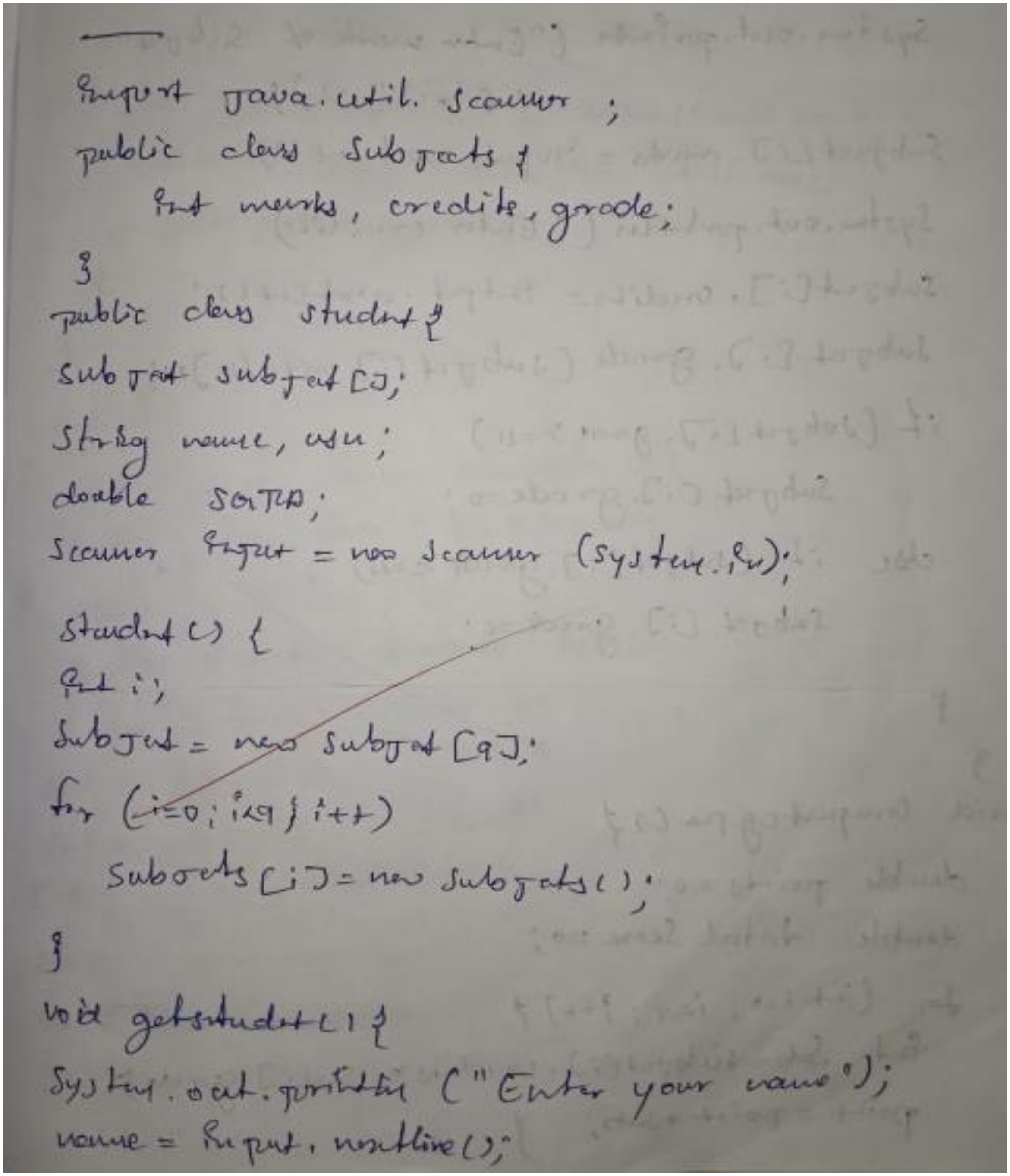
OUTPUT:



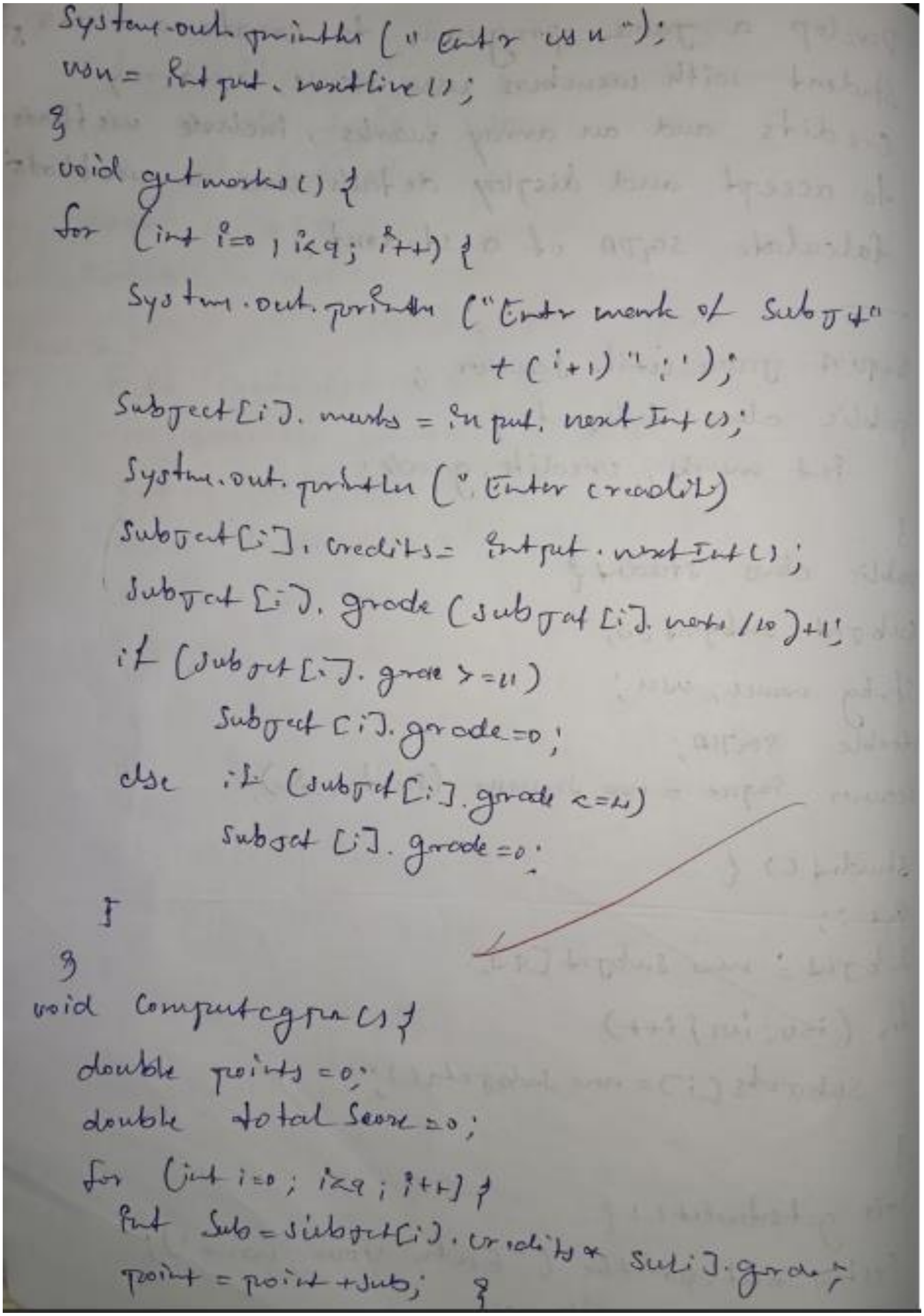
```
Enter coeffcient of a
0
Enter a non-zero value to coeffcient a
Enter coeffcient of a
10
Enter coeffcient of b
20
Enter coeffcient of c
30
Roots are real and imaginary
Root 1 : -1.0
Root 2 : 1.4142135623730951
Mahesha G S
USN : 24BECS429
PS C:\Users\mahesha\Desktop\mahi>
```

PROGRAM NO-2
Student CGPA

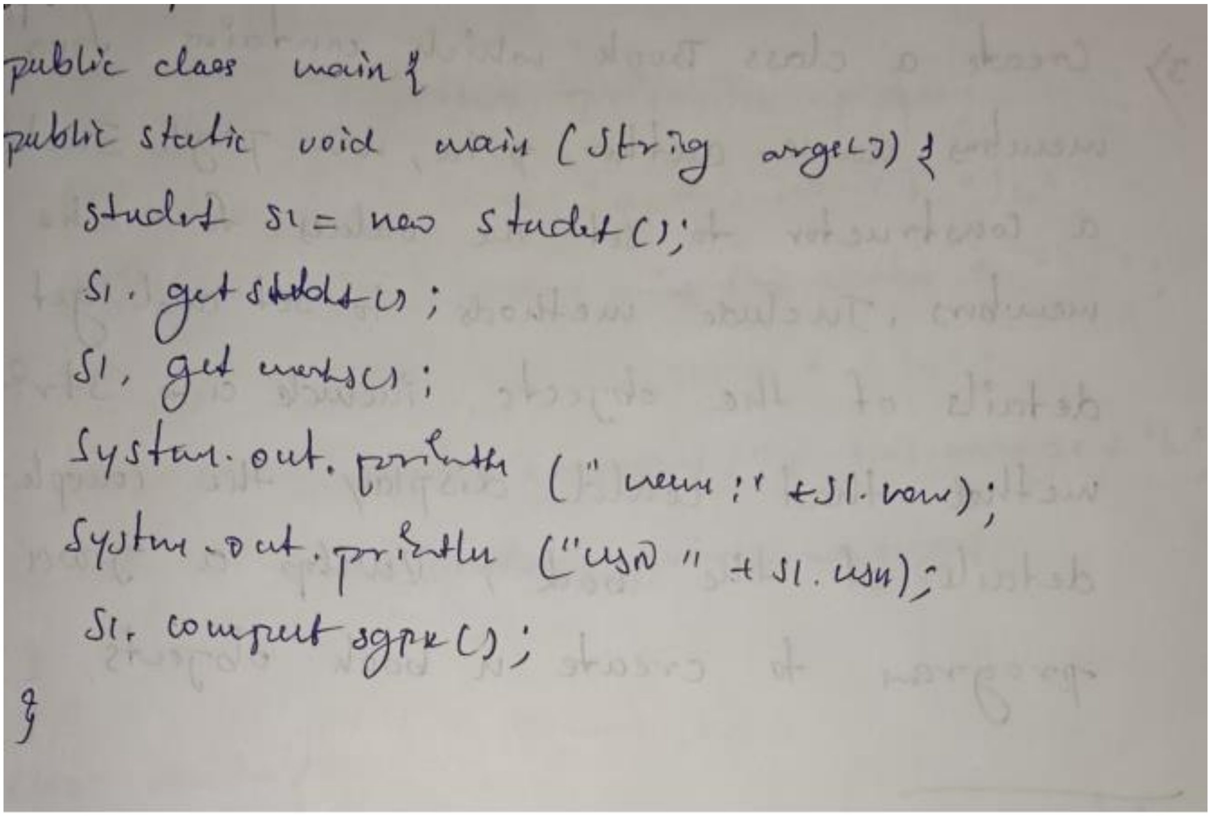
Algorithm:



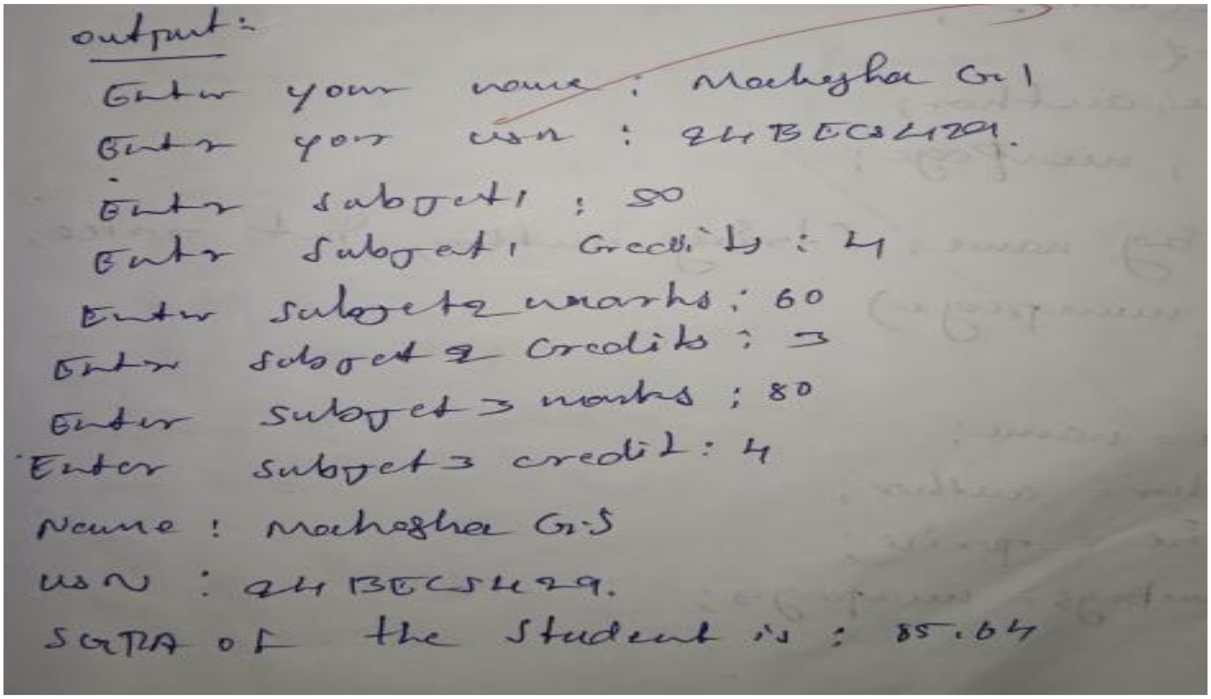
```
import java.util.Scanner ;
public class Subjects {
    int marks, credits, grade;
}
public class student {
subject subject [];
String name, usn;
double SGPA;
Scanner input = new Scanner (System.in);

Student () {
int i;
Subject = new subject [9];
for (i=0; i<9; i++)
    Subjects [i] = new Subjects ();
}
void getstudent () {
System.out.println ("Enter your name");
name = input. nextline();
```



```
System.out.println (" Entr usn ");
usn = Input. nextLine();
}
void getmarks() {
for (int i=0, i<9; i++) {
    System.out.println ("Entr mark of Subj#"
                          + (i+1) ":");
    Subject[i]. marks = input. nextInt();
    System.out.println (" Enter credit)
    Subject[i]. credits = Input. nextInt();
    Subject [i]. grade (subject [i]. marks/10)+1;
    if (Subject[i]. grade >=11)
          Subject [i]. grade=0;
    else if (subject[i]. grade <=4)
          subject [i]. grade=0;

  }
}
void computecgpa() {
  double points =0;
  double totalScore =0;
  for (int i=0; i<9; i++) {
    int Sub = subject[i]. credits * Sub[i]. grade;
    point = point + Sub;  }
```



```
public class main {
public static void main (String args[]) {
  student s1 = new student();
  s1. getstudent();
  s1, get marks();
  System.out.println ("name :" +s1.name);
  System.out.println ("usn " + s1.usn);
  s1. compute sgpa();
}
```



output:

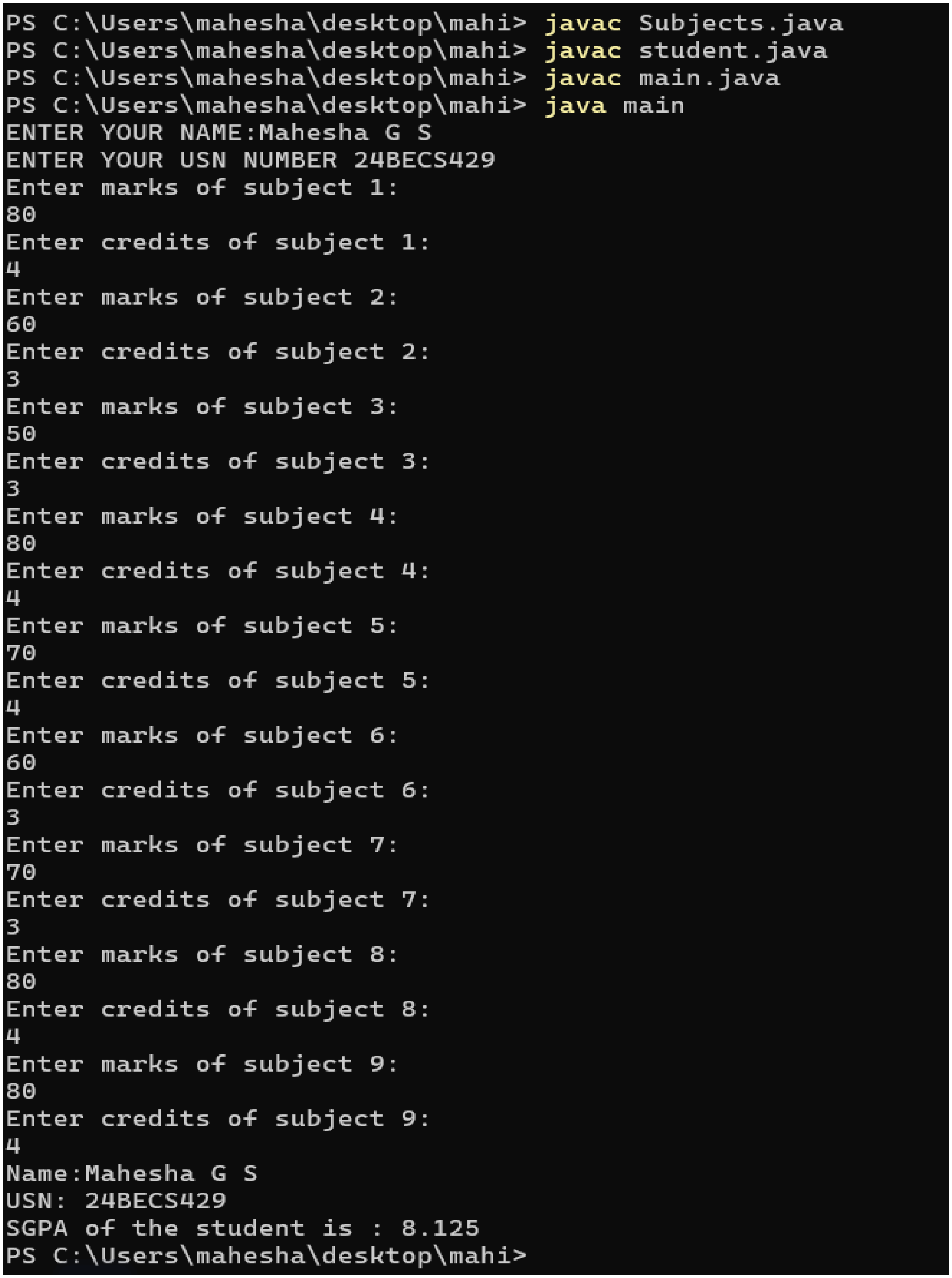
```
  Enter your name : Mahesha G S
  Enter your usn : 24BEC2429.
  Enter subject1 : 80
  Enter subject1 Credits : 4
 Enter subject2 marks : 60
Enter subject2 Credits : 3
Enter subject3 marks ; 80
Enter subject3 credit : 4
Name : Mahesha G.S
usn : 24BECS429.
SGPA of the Student is : 85.64
```

Code:

```
import java.util.Scanner;
public class Subjects{
    int marks,credits,grade;
    }
public class student {
        Subjects subject[];
        String name,usn;
        double SGPA;
        Scanner input=new Scanner(System.in);

        student()
        {
        int i;
        subject= new Subjects[9];
        for(i=0;i<9;i++)
        subject[i] = new Subjects();

        }
        void getstudet() {
            System.out.print("ENTER YOUR NAME:");
            name=input.nextLine();
            System.out.print("ENTER YOUR USN NUMBER");
            usn=input.nextLine();
        }
        void getmarks() {
            for(int i=0;i<9;i++) {
                System.out.println("Enter marks of subject
"+(i+1)+":");
                subject[i].marks=input.nextInt();
                System.out.println("Enter credits of subject
"+(i+1)+":");
                subject[i].credits=input.nextInt();
                subject[i].grade=(subject[i].marks/10)+1;
                if (subject[i].grade>=11)
```

```
                    subject[i].grade=10;
                else if(subject[i].grade<=4)
                    subject[i].grade=0;
            }
        }
        void computeSGPA(){
            double points=0;
            double totalcredits=0;
            for (int i=0;i<9;i++) {
                int sub=subject[i].credits*subject[i].grade;
                points=points+sub;
                totalcredits=totalcredits+subject[i].credits;
            }
            SGPA=points/totalcredits;
            System.out.println("SGPA of the student is : "+SGPA);
            }
}

public class main{
    public static void main(String args[]) {
        student s1 = new student();
        s1.getstudet();
        s1.getmarks();
        System.out.println("Name:"+s1.name);
        System.out.println("USN:"+s1.usn);
        s1.computeSGPA()}}
```

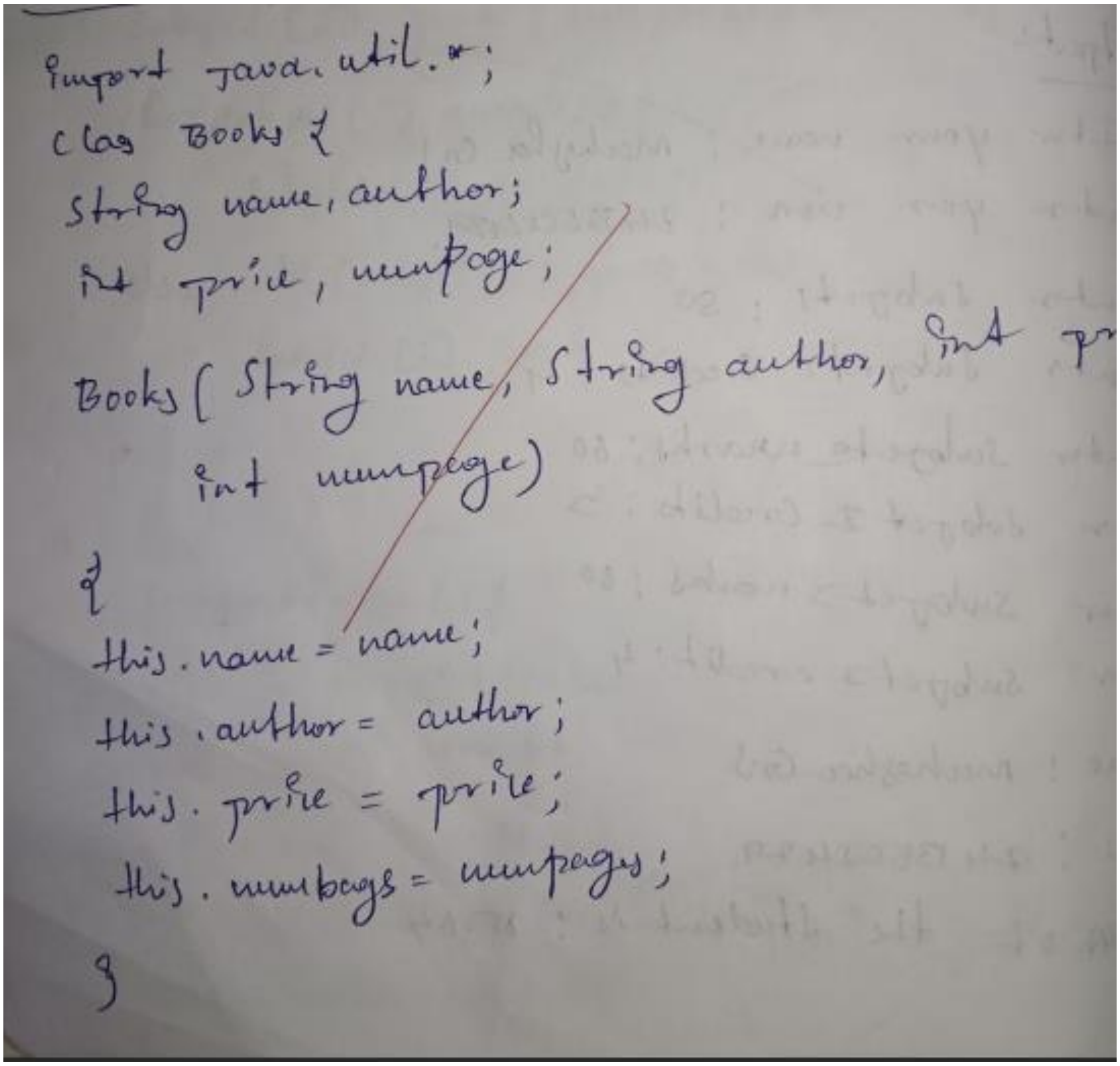
OUTPUT:



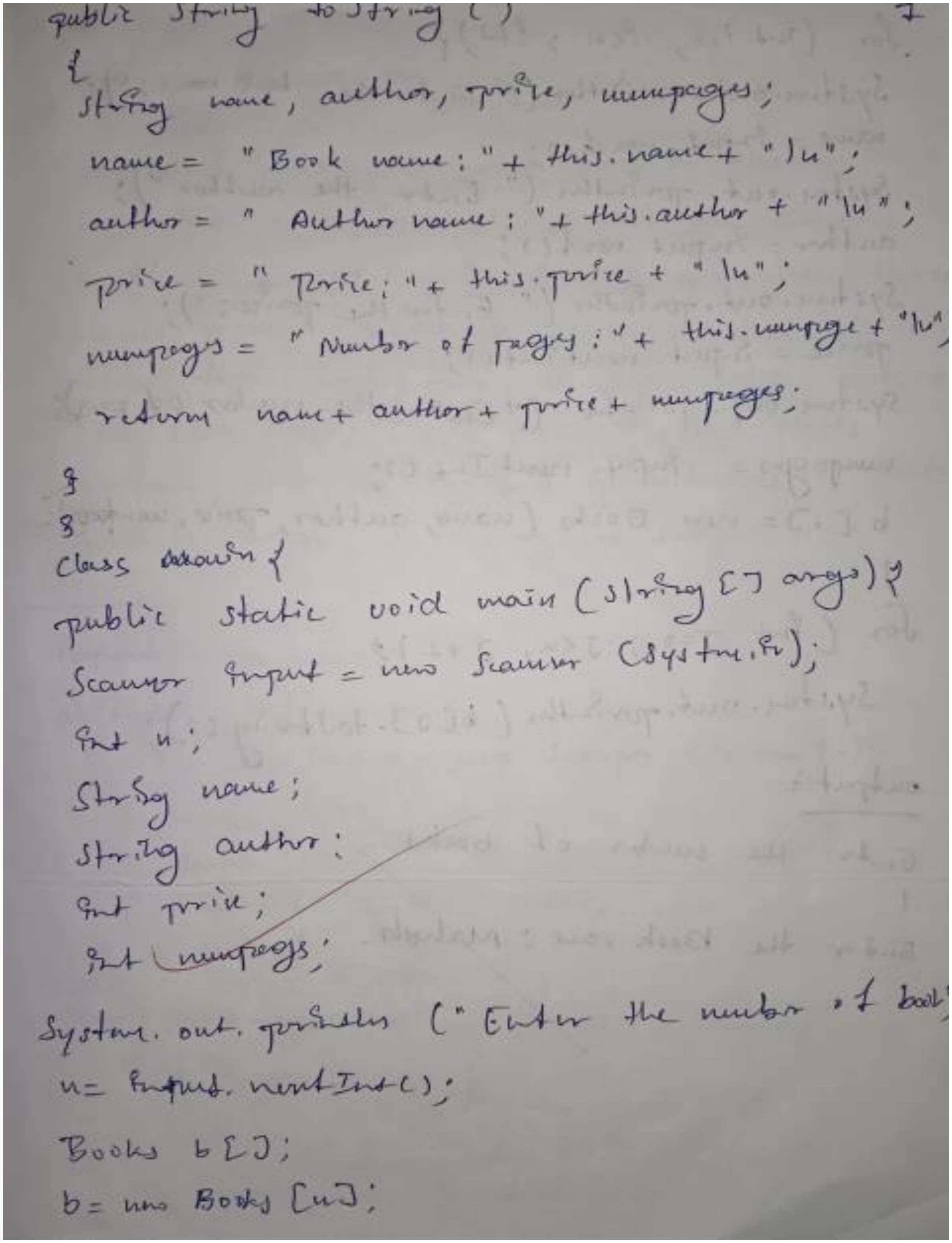
```
PS C:\Users\mahesha\desktop\mahi> javac Subjects.java
PS C:\Users\mahesha\desktop\mahi> javac student.java
PS C:\Users\mahesha\desktop\mahi> javac main.java
PS C:\Users\mahesha\desktop\mahi> java main
ENTER YOUR NAME:Mahesha G S
ENTER YOUR USN NUMBER 24BECS429
Enter marks of subject 1:
80
Enter credits of subject 1:
4
Enter marks of subject 2:
60
Enter credits of subject 2:
3
Enter marks of subject 3:
50
Enter credits of subject 3:
3
Enter marks of subject 4:
80
Enter credits of subject 4:
4
Enter marks of subject 5:
70
Enter credits of subject 5:
4
Enter marks of subject 6:
60
Enter credits of subject 6:
3
Enter marks of subject 7:
70
Enter credits of subject 7:
3
Enter marks of subject 8:
80
Enter credits of subject 8:
4
Enter marks of subject 9:
80
Enter credits of subject 9:
4
Name:Mahesha G S
USN: 24BECS429
SGPA of the student is : 8.125
PS C:\Users\mahesha\desktop\mahi>
```

PROGRAM NO-3:
Book Class

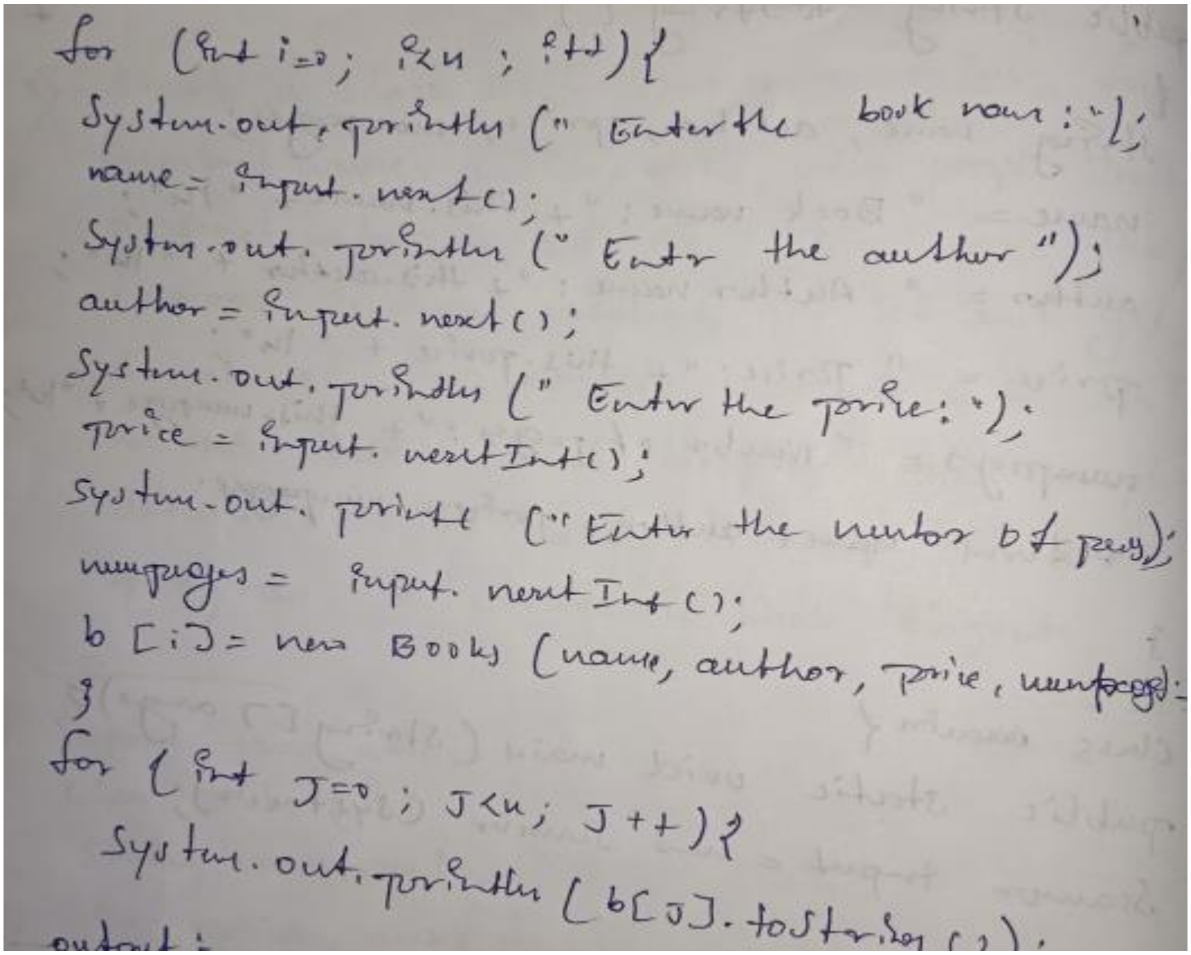
Algorithm:



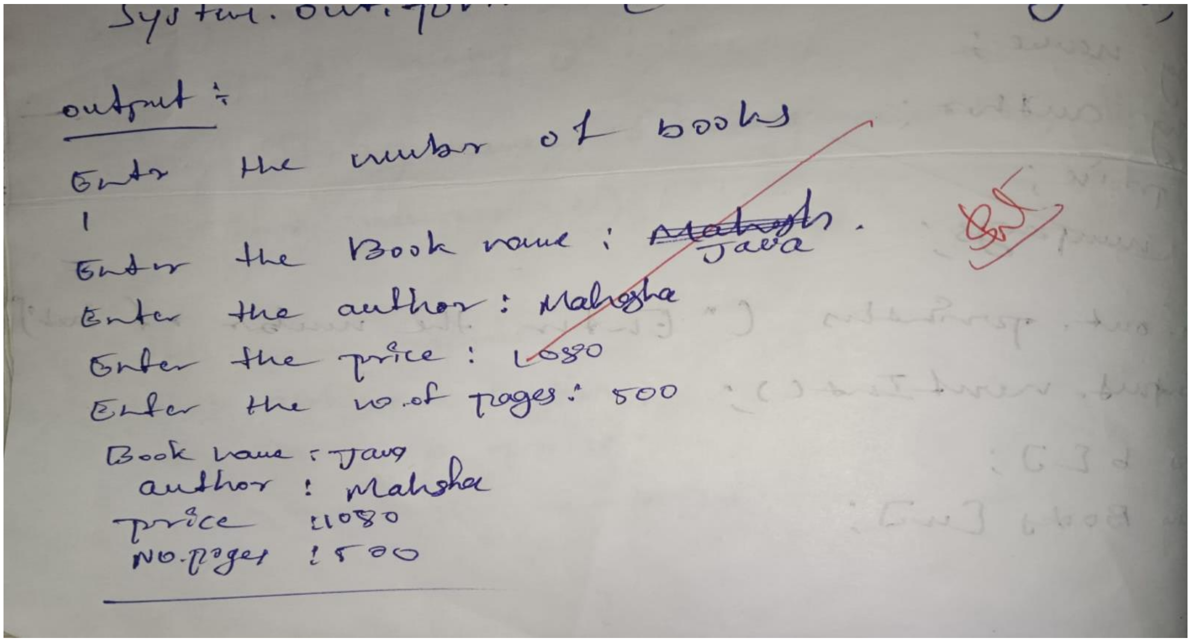
```
import Java.util.*;
class Books {
 String name, author;
 int price, numpage;

 Books( String name, String author, int pr
       int numpage)

 {
 this.name = name;
 this.author = author;
 this.price = price;
 this.numbags = numpages;
 }
```



```
public String toString ()                                  7
{
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.numpage + "\n"
return name+ author+ price+ numpages;

}
}
Class bookmain {
public static void main (String [] args) {
Scanner input = new Scanner (System.in);
int n;
String name;
String author;
int price;
int numpegs;
System.out.println (" Enter the number of book
n= input.nextInt();
Books b[];
b= new Books [n];
```



```
for (int i=0; i<n ; i++){
 System.out.println (" Enter the  book name :");
 name = input.next();
 System.out.println (" Enter the author ");
 author = input.next();
 System.out.println (" Enter the price: ");
 price = input.nextInt();
 System.out.printl ("Enter the number of pages);
 numpages = input.nextInt();
 b [i]= new Books (name, author, price, numpages);
}
for (int J=0 ; J<n; J++){
  System.out.println (b[J].toString());
output :
```

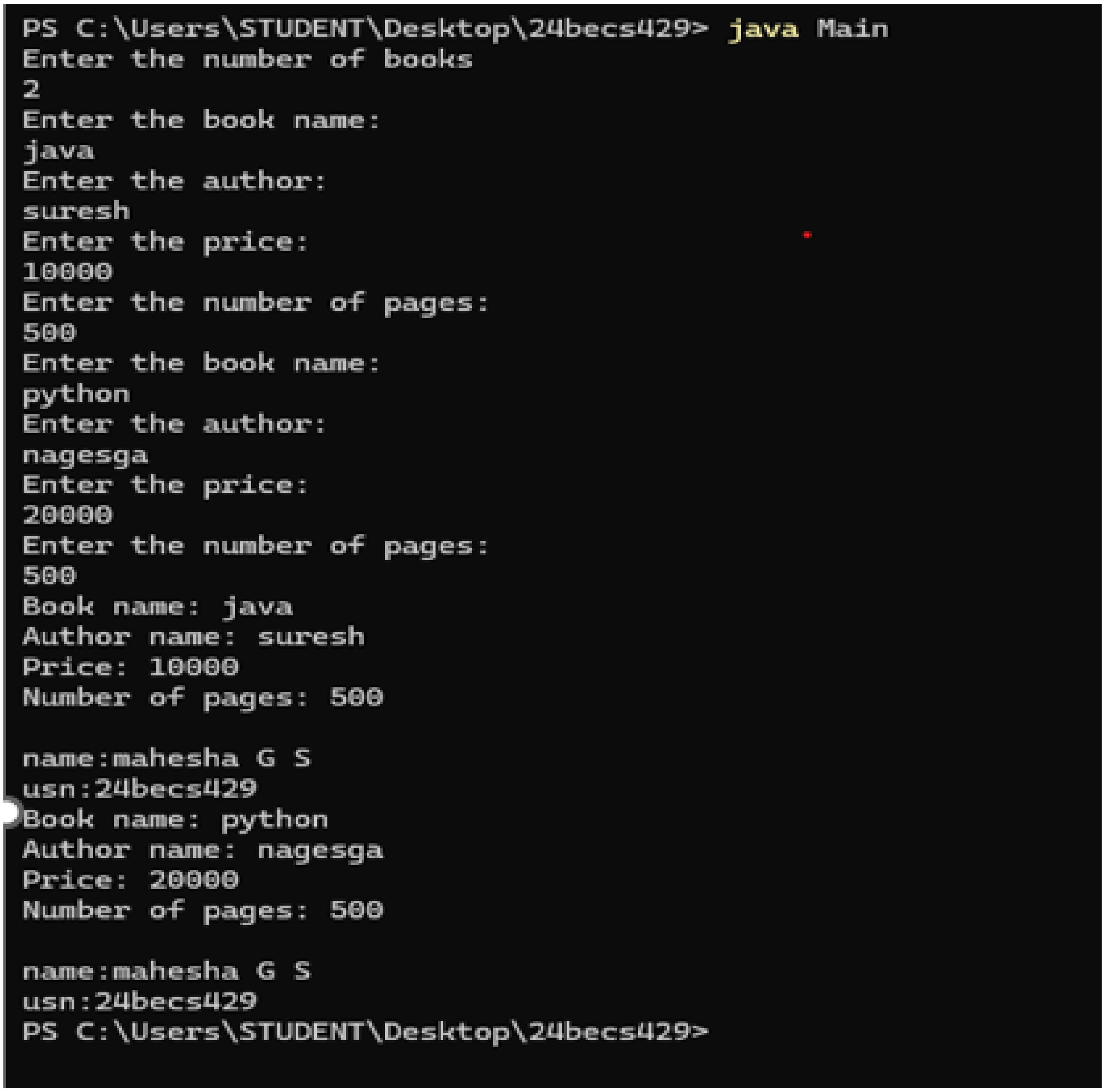


```
  System.out.pr
output :
Enter the number of books
1
Enter the Book name : ~~Mahesh~~ Java .
Enter the author : Mahesha
Enter the price : 1080
Enter the no.of pages : 500
 Book name : Java
  author : Mahesha
 price :1080
 No.pages :500
```

Code:

```
import java.util.*;
class Books{
String name,author;
int price,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 input=  new Scanner(System.in);

int n;
String name;
String author;
int price;
int numpages;

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

Books b[];
b=new Books[n];
for (int i=0;i<n;i++){
System.out.println("Enter the book name:");
name=input.next();
System.out.println("Enter the author:");
author=input.next();
System.out.println("Enter the price:");
price=input.nextInt();
System.out.println("Enter the number of pages:");
numpages=input.nextInt();
b[i]=new Books(name,author,price,numpages);
}
for (int j=0;j<n;j++){
System.out.println(b[j].toString());
System.out.println("name:mahesha G S");
System.out.println("usn:24becs429");

}
}
}
```

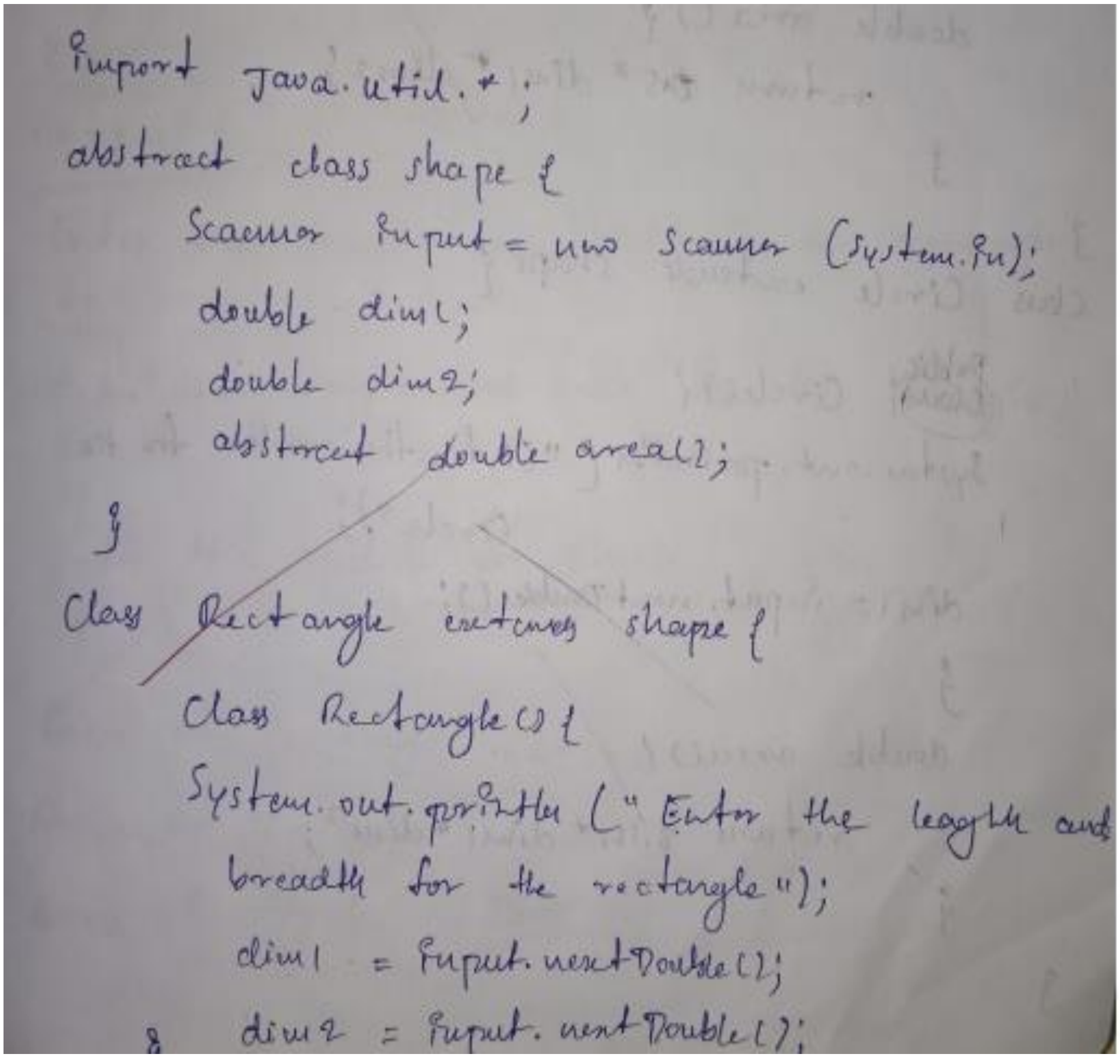
OUTPUT:



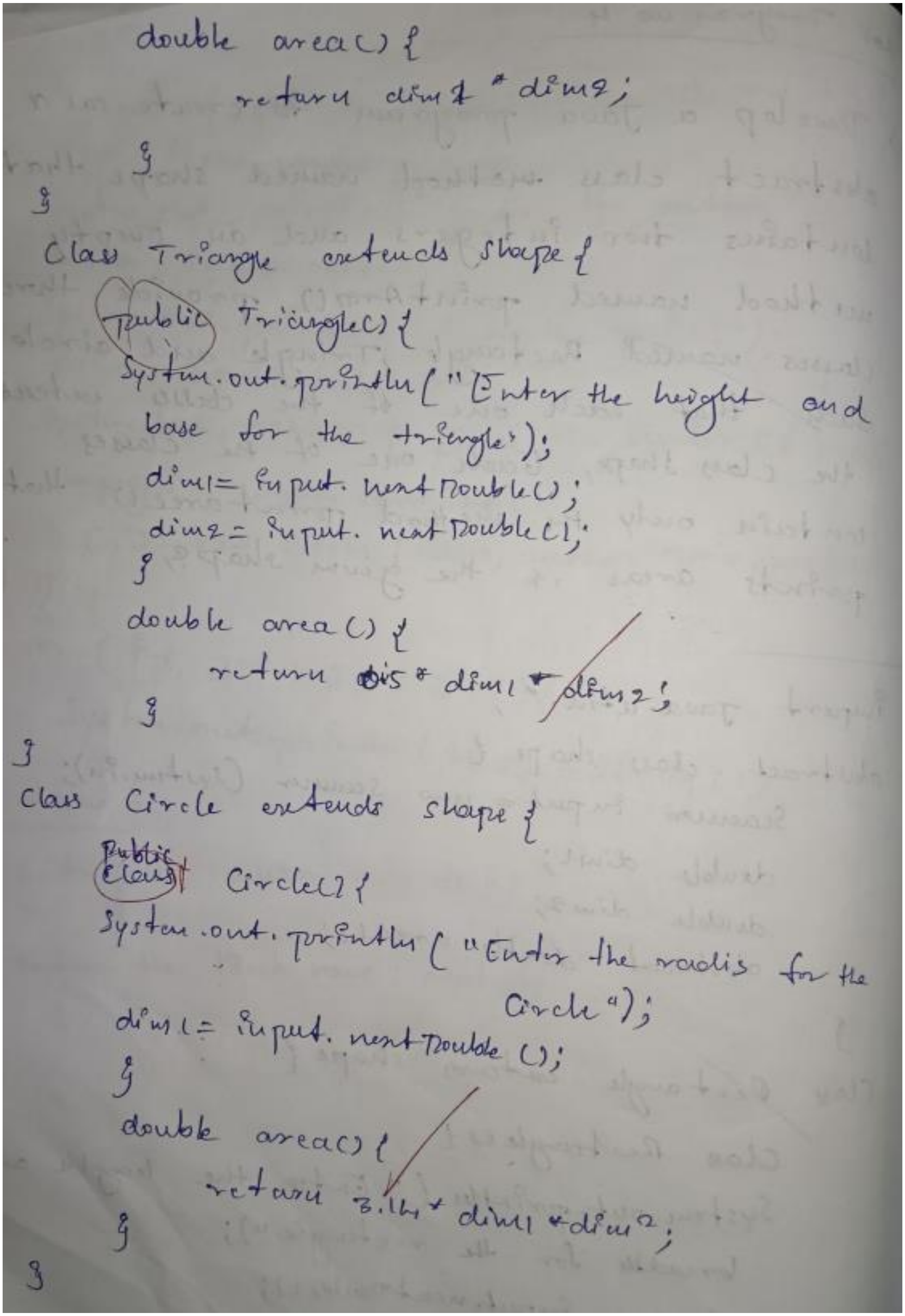
```
PS C:\Users\STUDENT\Desktop\24becs429> java Main
Enter the number of books
2
Enter the book name:
java
Enter the author:
suresh
Enter the price:
10000
Enter the number of pages:
500
Enter the book name:
python
Enter the author:
nagesga
Enter the price:
20000
Enter the number of pages:
500
Book name: java
Author name: suresh
Price: 10000
Number of pages: 500

name:mahesha G S
usn:24becs429
Book name: python
Author name: nagesga
Price: 20000
Number of pages: 500

name:mahesha G S
usn:24becs429
PS C:\Users\STUDENT\Desktop\24becs429>
```

PROGRAM NO-4:
Abstraction

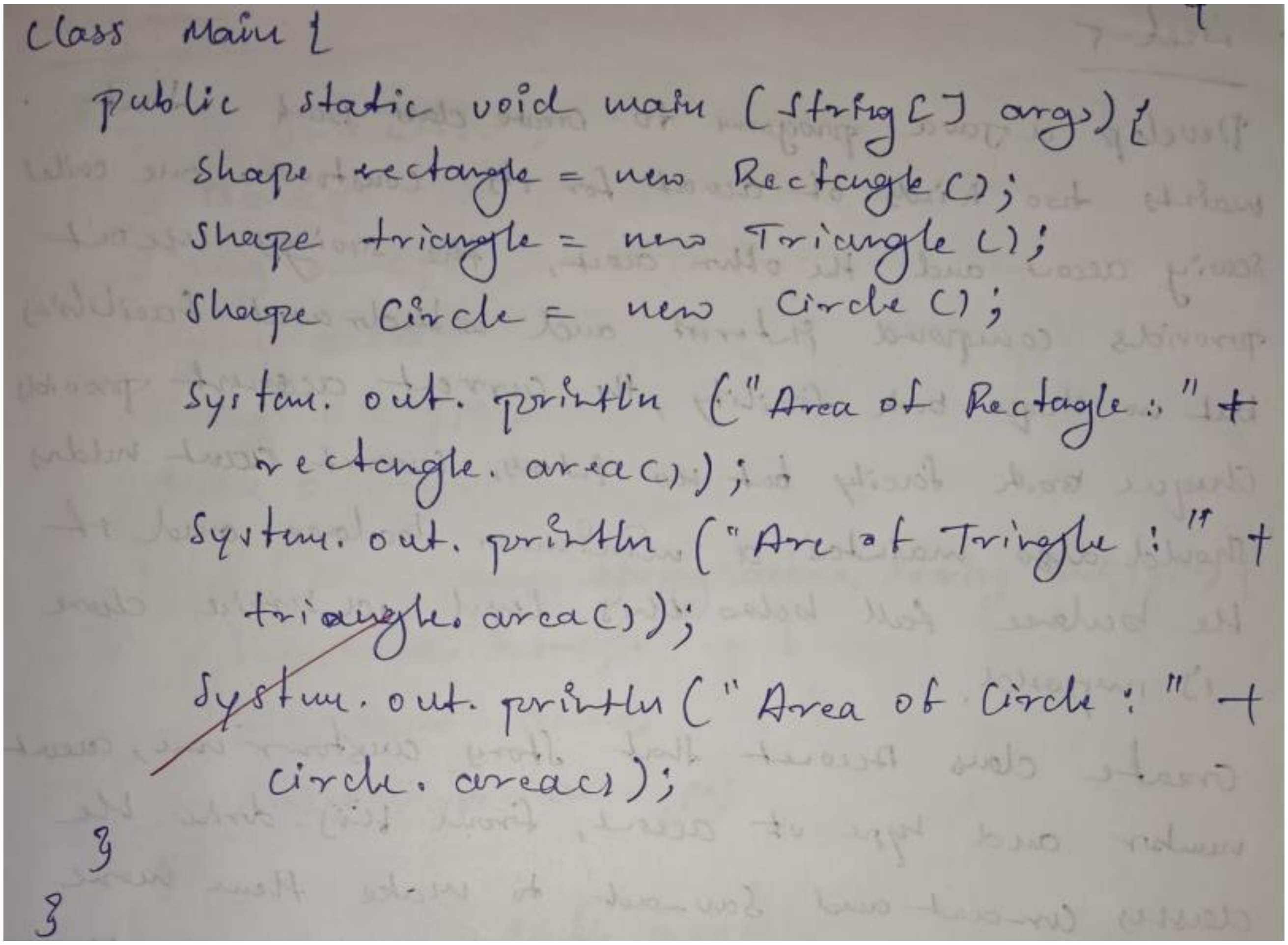
Algorithm:



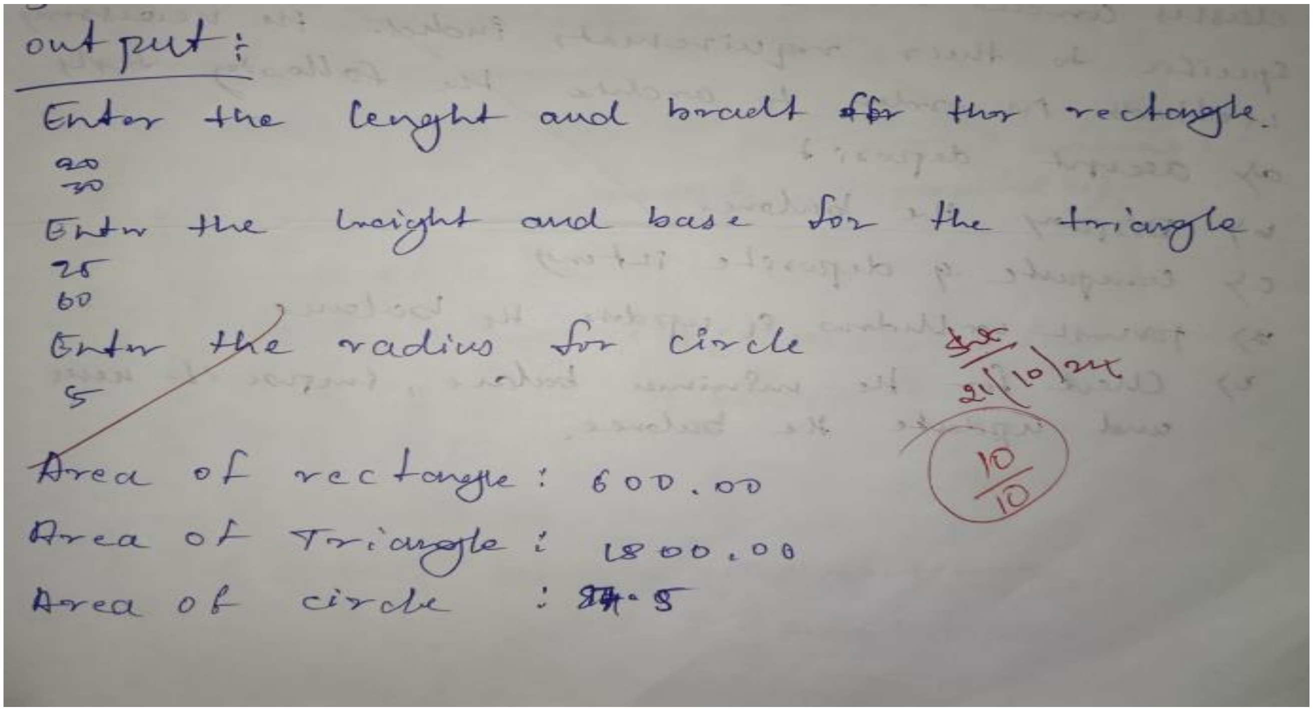
```
import Java.util.* ;
abstract class shape {
      Scanner input = new Scanner (System.in);
      double dim1;
      double dim2;
      abstract double area();
  }
Class Rectangle extends shape {
      Class Rectangle() {
      System.out.println (" Enter the length and
        breadth for the rectangle");
        dim1 = input.nextDouble();
        dim2 = input.nextDouble();
```



```
    double area(){
            return dim1 * dim2;
    }
}
Class Triangle extends shape{
   Public Triangle(){
   System.out.println("Enter the height and
    base for the triangle");
    dim1= input.nextDouble();
    dim2= input.nextDouble();
    }
    double area(){
          return 0.5 * dim1 * dim2;
    }
}
Class Circle extends shape{
   ~~Class~~ Public Circle(){
   System.out.println("Enter the radis for the
                              Circle");
   dim1= input.nextDouble();
   }
   double area(){
         return 3.14 * dim1 * dim2;
   }
}
```



```
class Main {
  public static void main (String[] args) {
    Shape rectangle = new Rectangle();
    Shape triangle = new Triangle();
    Shape Circle = new Circle();

    System.out.println ("Area of Rectagle : " +
        rectangle.area());
    System.out.println ("Are of Tringle : " +
        triangle.area());
    System.out.println ("Area of Circle : " +
        circle.area());
  }
}
```



output :

```
Enter the lenght and bradt for thr rectangle.
20
30
Entr the height and base for the triangle.
25
60
Entr the radius for circle
5

Area of rectangle : 600.00
Area of Triangle : 1800.00
Area of circle    : 84.5
```

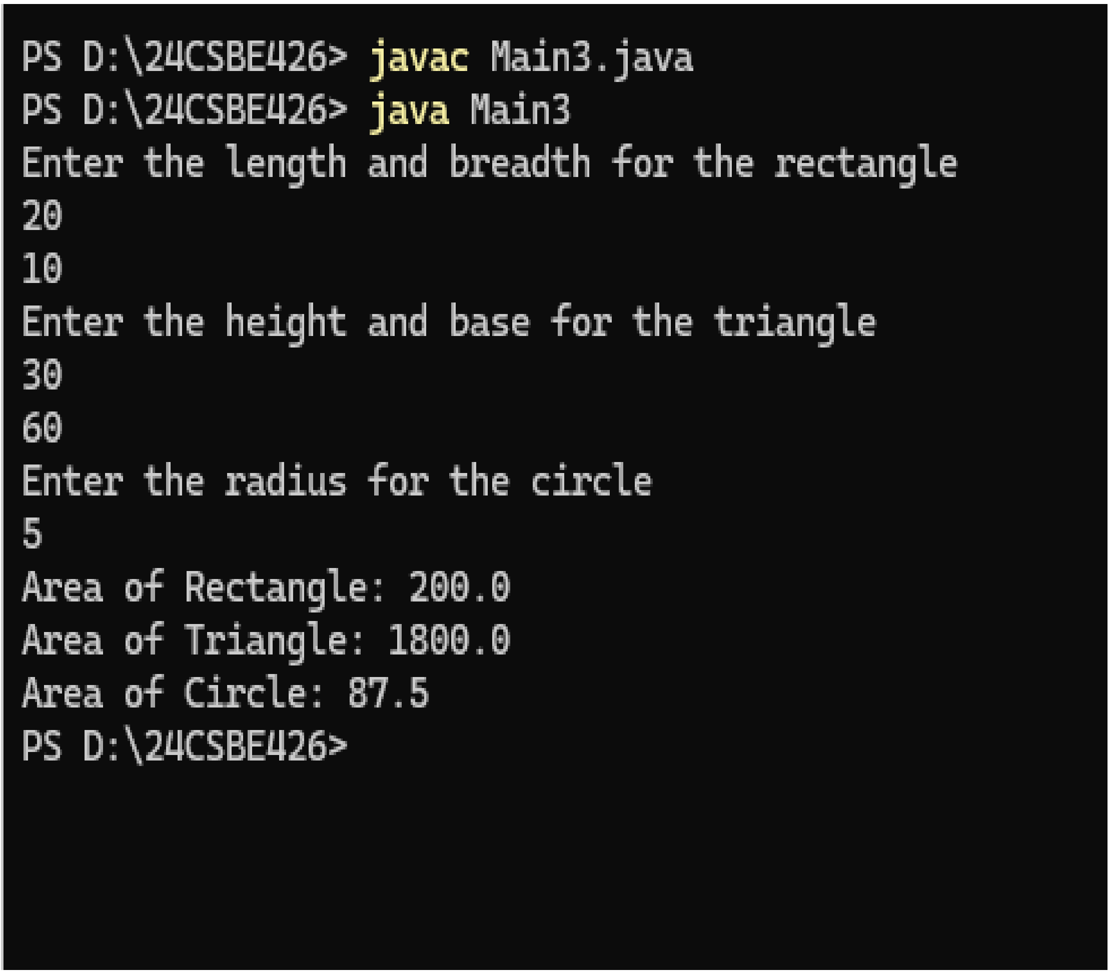
21/10/24

10/10

Code:

```
import java.util.*;
abstract class Shape {
    Scanner input=new Scanner(System.in);
    double dim1;
    double dim2;
    abstract double area();
}


class Rectangle extends Shape {


     Rectangle() {
    System.out.println("Enter the length and breadth for the rectangle");
     dim1=input.nextDouble();
     dim2=input.nextDouble();
    }

    @Override
    double area() {
        return dim1 * dim2;
    }
}


class Triangle extends Shape {


     Triangle() {
    System.out.println("Enter the height and base for the triangle");
     dim1=input.nextDouble();
     dim2=input.nextDouble();
    }
    @Override
    double area() {
        return 0.5 * dim2 * dim2;
    }
}


class Circle extends Shape {


     Circle() {
    System.out.println("Enter the radius for the circle");
     dim1=input.nextDouble();

    }

    @Override
    double area() {
        return 3.5*dim1*dim1;
    }
}


public class Main3 {
    public static void main(String[] args) {
        Shape rectangle = new Rectangle();
        Shape triangle = new Triangle();
        Shape circle = new Circle();

        System.out.println("Area of Rectangle: " + rectangle.area());
        System.out.println("Area of Triangle: " + triangle.area());
        System.out.println("Area of Circle: " + circle.area());
    }
}
```

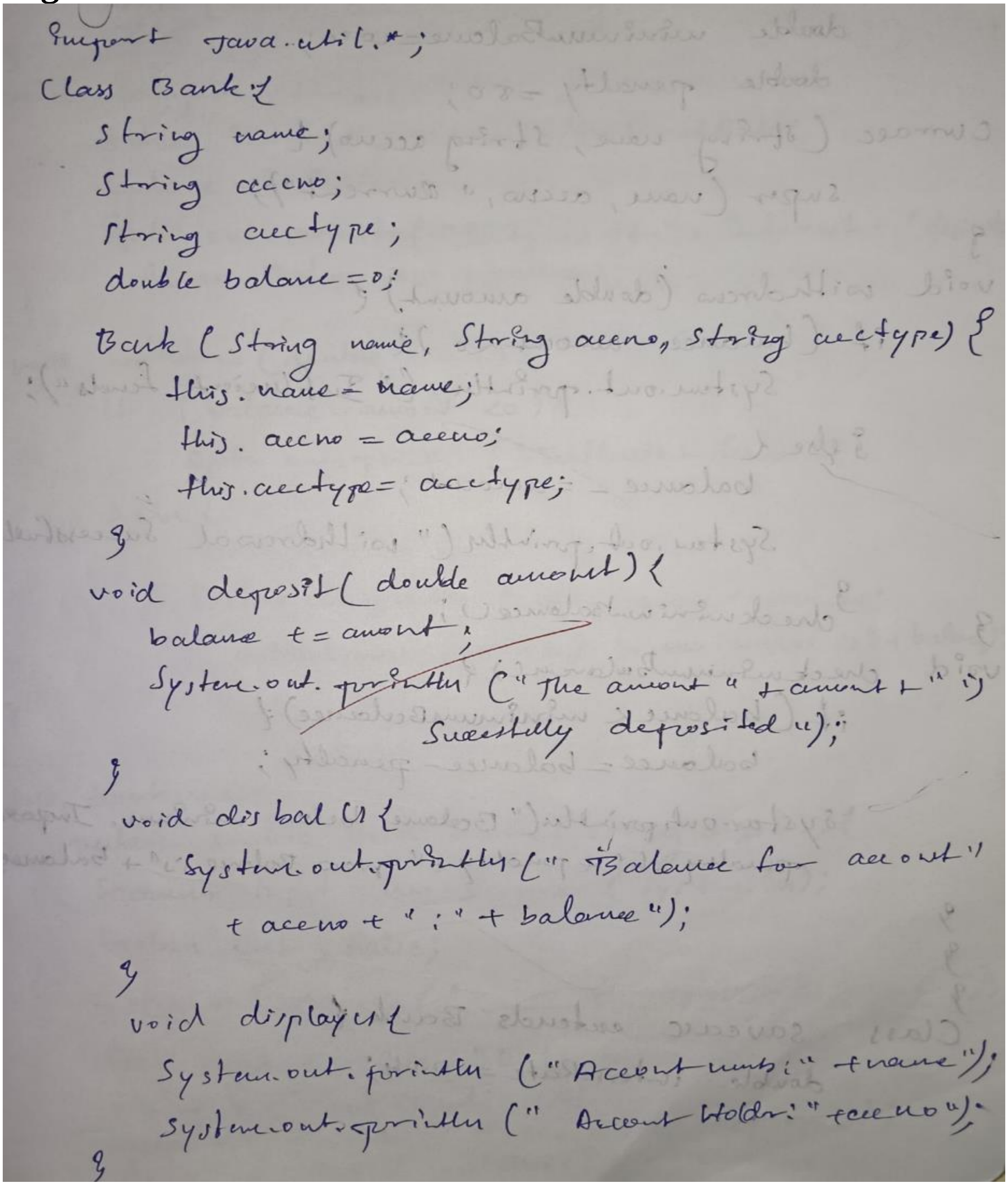
OUTPUT:



```
PS D:\24CSBE426> javac Main3.java
PS D:\24CSBE426> java Main3
Enter the length and breadth for the rectangle
20
10
Enter the height and base for the triangle
30
60
Enter the radius for the circle
5
Area of Rectangle: 200.0
Area of Triangle: 1800.0
Area of Circle: 87.5
PS D:\24CSBE426>
```

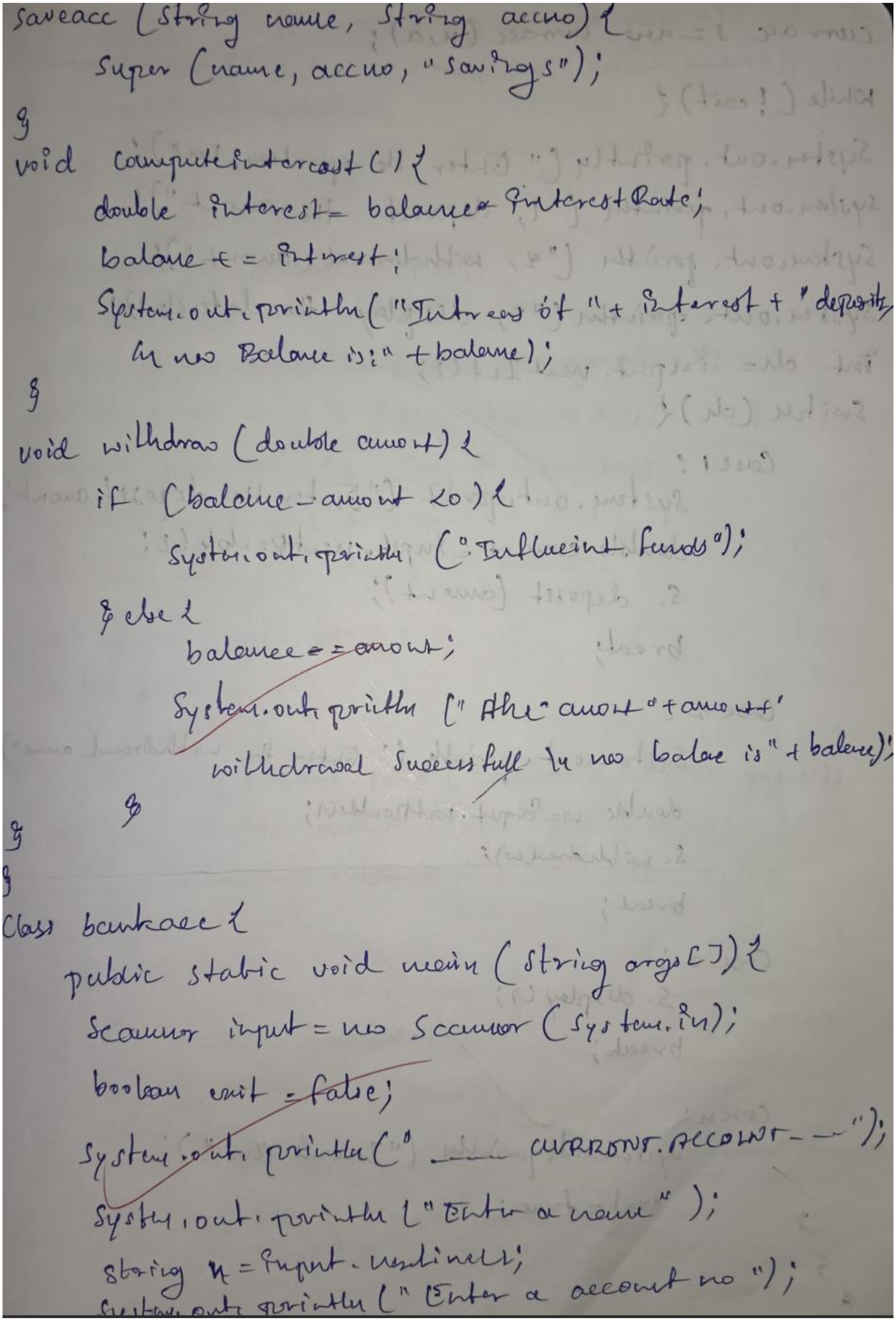
PROGRAM NO-5:
Inheritance

Algorithm:

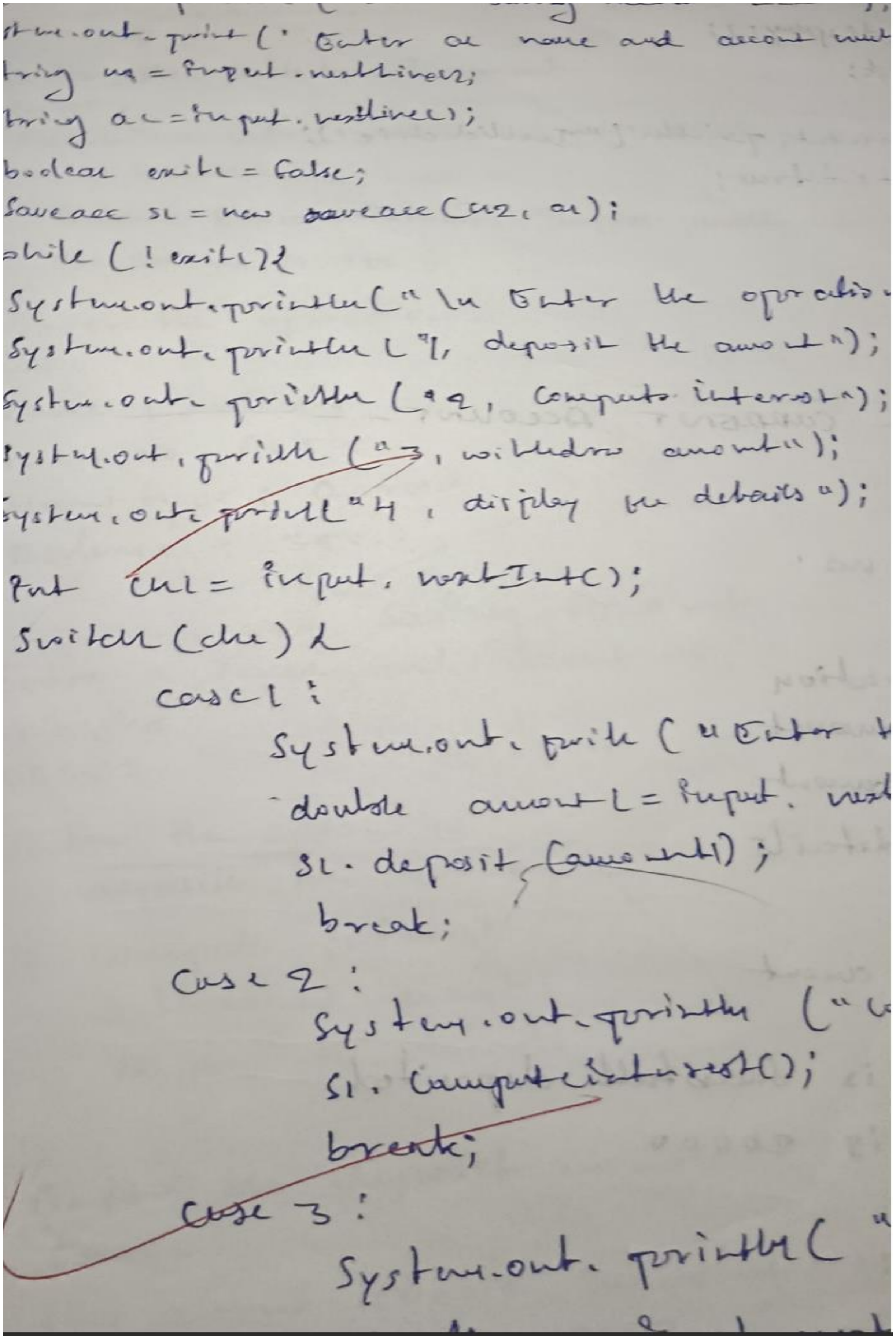


```
Import Java.util.*;
Class Bank{
   String name;
   String accno;
   String acctype;
   double balance =0;

   Bank (String name, String accno, String acctype) {
       this.name = name;
       this. accno = accno;
       this.acctype= acctype;
   }
   void deposit( double amount){
      balance += amount;
      System.out.println ("The amount " + amount + " "
                    Sucessfully deposited ");
   }
   void disbal (){
      System.out.println(" Balance for account"
          + accno + " : " + balance ");
   }
   void display(){
     System.out.println (" Account numb: " +name");
     System.out.println (" Account Holdr: " +accno ");
   }
```

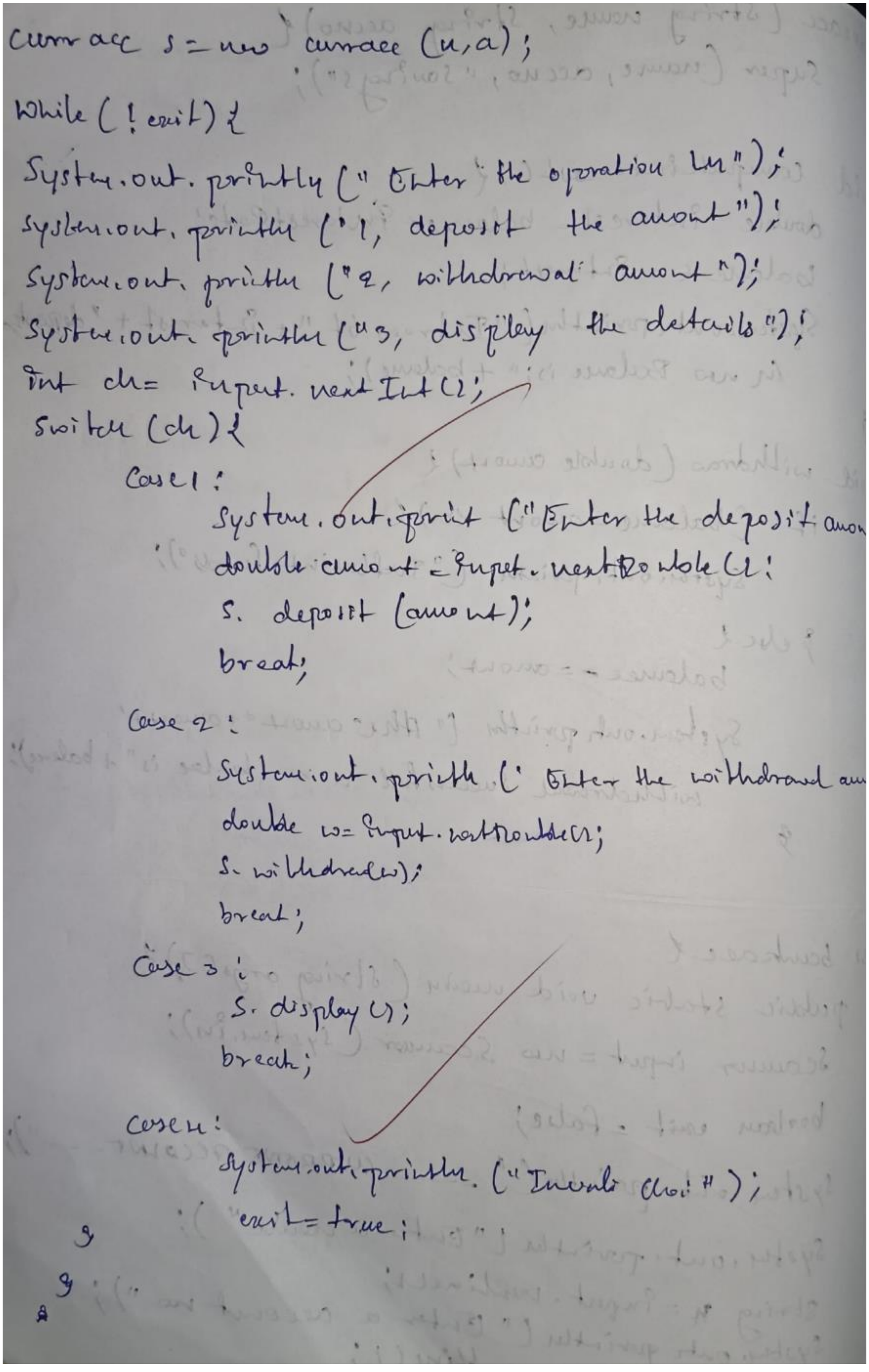
```
Class  currace  extends  Bank {
        double  minimumBalance=1000;
        double  penalty =50;
Curracc (String name, String accno) {
        super (name, accno, " current");
}
void  withdraw (double amount) {
    if (balance - amount <0 ){
            System.out.println (" Influeient funds");
      }else {
            balance -= amount;
            System.out.println(" withdrawal Successful
      }
}      checkminimumBalance();
void  checkminimumBalance() {
      if (balance< minimumBalance) {
            balance= balance- penalty;
      System.out.println(" Balance below minimum, Impos
      penalty of " + penalty + ", New Balance is" + balance
 }
}
}
Class   saveacc  extends Bank {
      double  interseRate = 0.04;
```



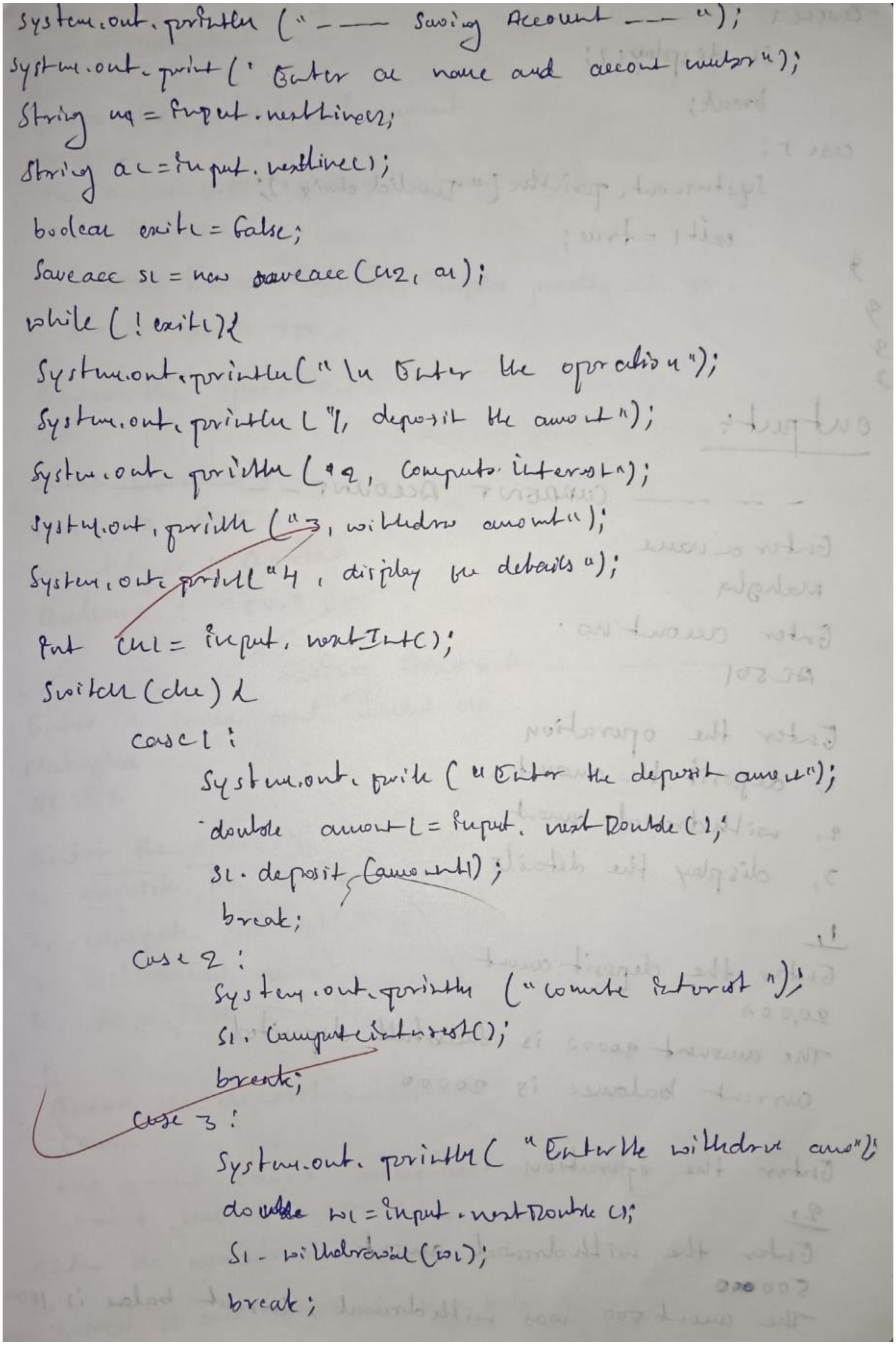
```
saveacc (String name, String accno){
    Super (name, accno, "savings");
}
void computeintercast (){
    double interest= balance* interestRate;
    balane += intrest;
    System.out.println("Intrest of "+ interest + "deposite,
      in new Balance is:" +balane);
 }
void withdraw (double amont) {
    if (balane - amont <0) {
        System.out.println (".Insuficint funds");
    } else {
        balance -= amont;
        System.out.println (" the amont "+amont+'
          withdrawal Successfull \n new balae is" + balance);
    }
}
}
Class bankacc {
  public stabic void main (String args[]) {
   Scanner input = new Scanner (System.in);
   boolean exit = false;
   System.out.printla(" ____ CURRENT.ACCOUNT-- ");
   System.out.printlu ("Enter a name" );
   string n = input.nextline();
   System.out.printlu (" Enter a account no ");
```



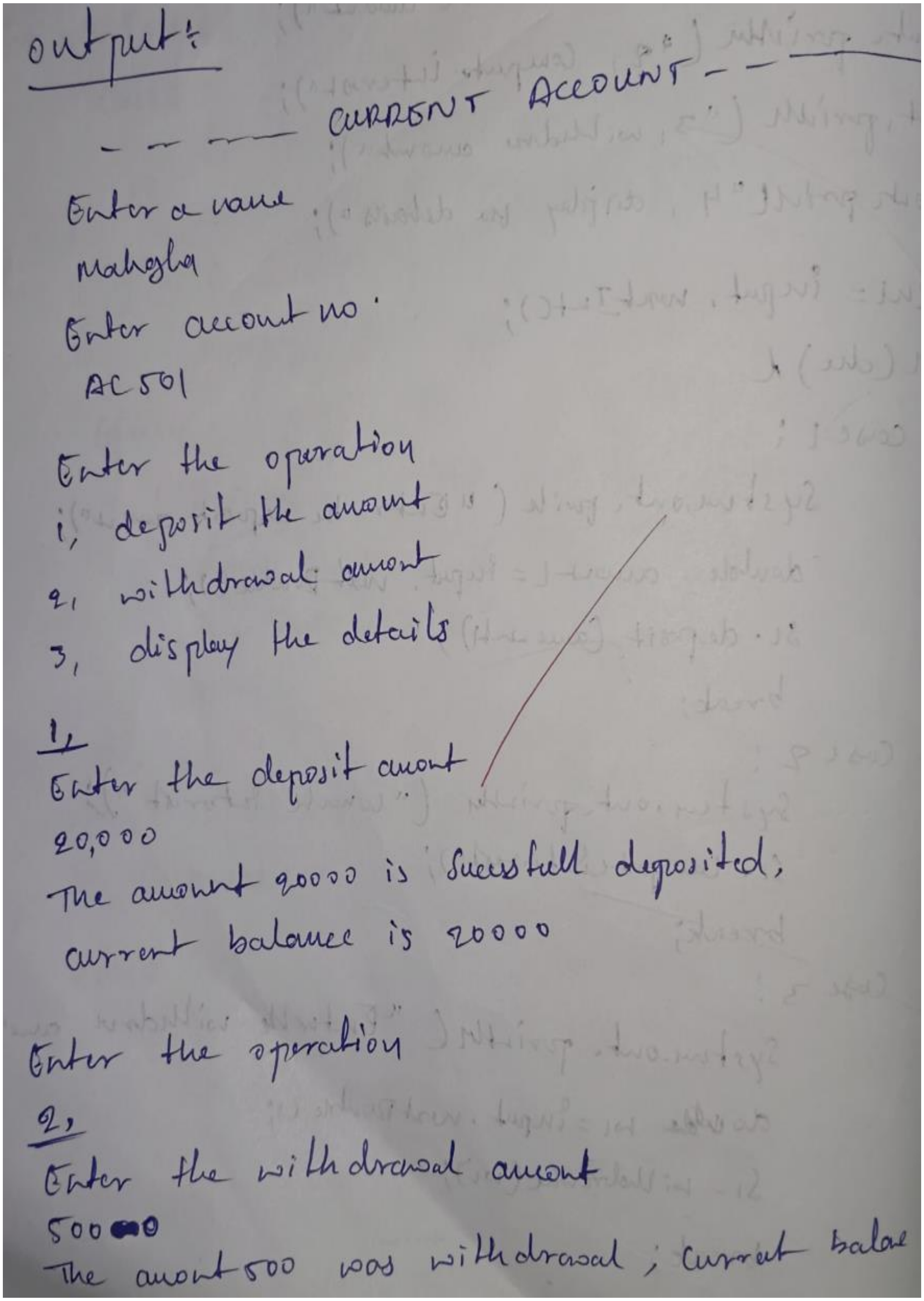
```
stem.out.print(' Enter ac name and accont num
tring na = input.nextLine();
tring ac=input.nextLine();
boolean exit = false;
Saveacc s1 = new saveacc(na2, ac);
while (!exit){
System.out.println(" \n Enter the operation
System.out.println("1, deposit the amount");
System.out.println("2, compute interest");
System.out.println("3, withdraw amount");
System.out.println("4, display the details");

int ch1= input. nextInt();
Switch (ch1) {
      case1 :
            System.out.print (" Enter t
            double amount1 = input. next
            s1. deposit (amount1);
             break;
      Case 2 :
            System.out.println ("c
            s1. Computeinterest();
            break;
      case 3 :
            System.out.println( "
```



```
curracc s = new curracc (n,a);
While ( ! exit) {
System.out.println (" Enter the operation \n");
System.out.println ("1, deposit the amont");
System.out.println ("2, withdrawal amount ");
System.out.println ("3, display the details ");
int ch= input.nextInt();
switch (ch) {
      case1 :
            System.out.print ("Enter the deposit amon
            double amount = input.nextDouble():
            s. deposit (amount);
            break;
      case 2 :
            System.out.println (" Enter the withdrawl am
            double w= input.nextDouble();
            s.withdraw(w);
            break;
      Case 3 :
            s.display ();
            break;
      case4 :
            System.out.println. ("Invalid choi ");
            exit= true;
   }
  }
}
```

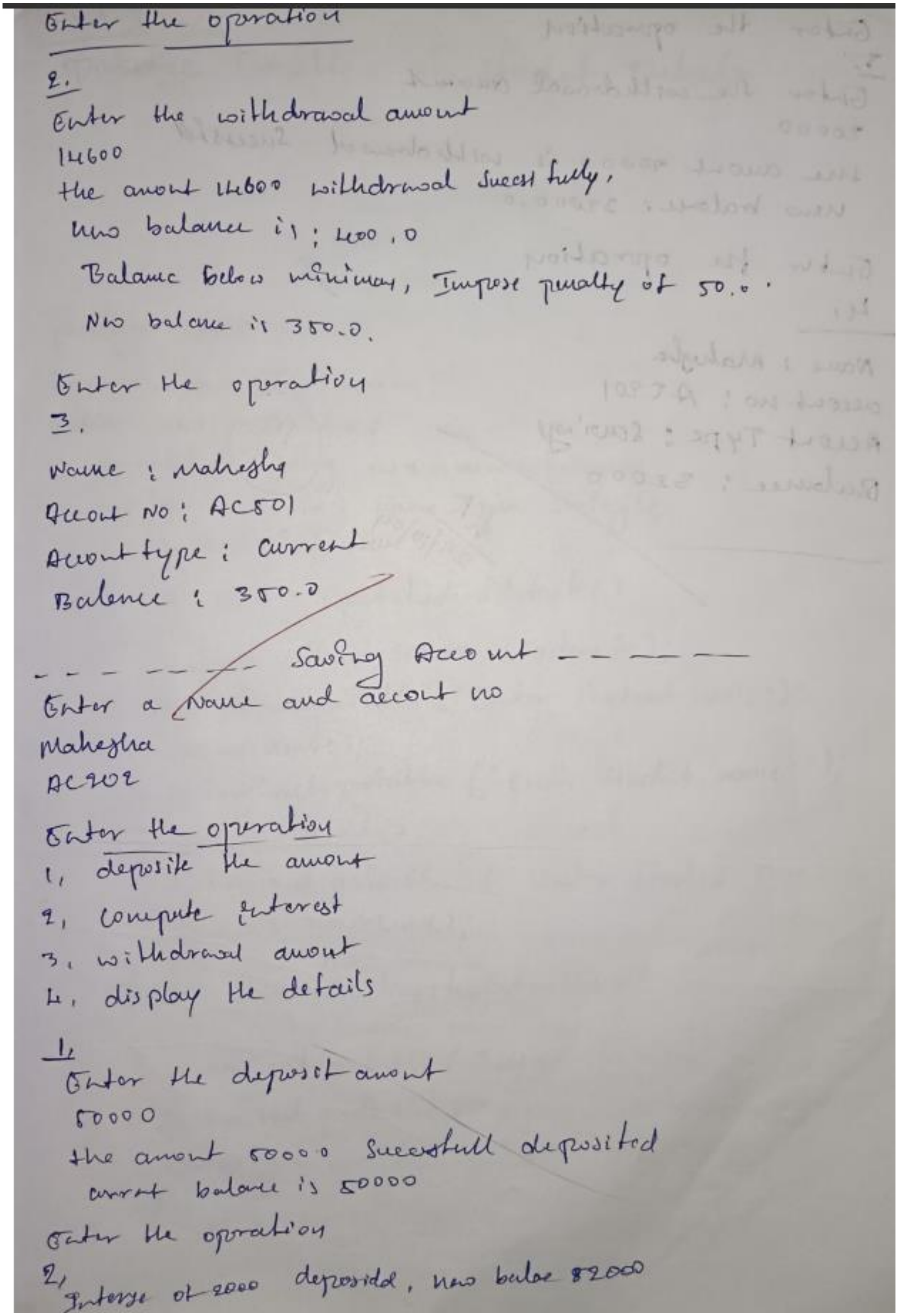


```
System.out.println ("---- Saving Account ---- ");
System.out.print (" Enter ac name and account number");
String na = input.nextLine();
String ac = input.nextLine();
boolean exit = false;
Saveacc s1 = new saveacc(n2, a1);
while (!exit){
System.out.println("\n Enter the operation");
System.out.println ("1, deposit the amount");
System.out.println ("2, Compute interest");
System.out.println ("3, withdraw amount");
System.out.println("4 , display the details");

int ch = input.nextInt();
switch (che) {
        case1 :
              System.out.print ("Enter the deposit amount");
              double amount1 = input.nextDouble ();
              s1.deposit (amount1);
               break;
        case 2 :
              System.out.println ("compute interest ");
              s1.computeinterest();
              break;
        case 3 :
              System.out.println( "Enter the withdraw amo");
              double w1 = input.nextDouble ();
              s1.withdrawal(w1);
              break;
```

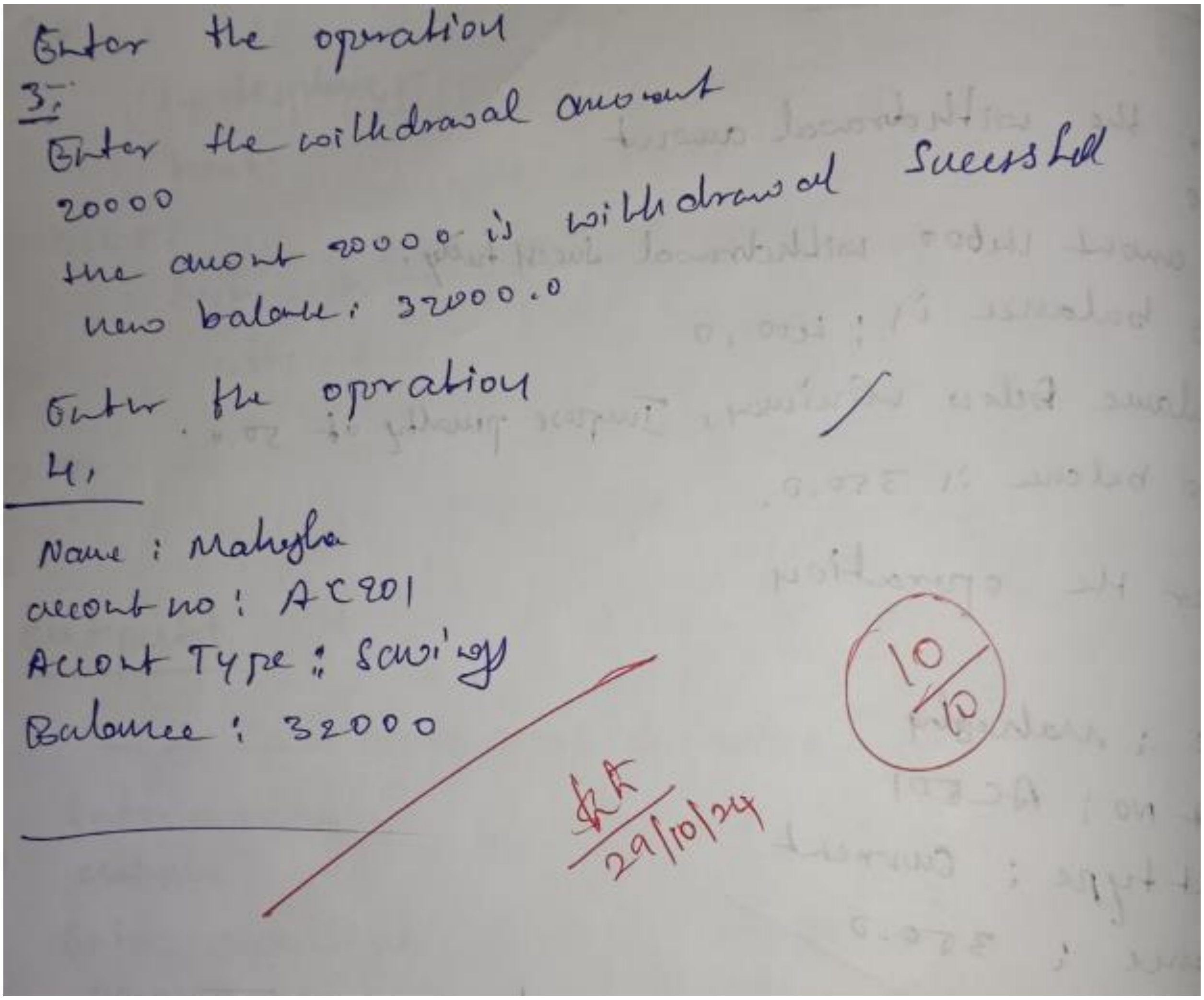


output:

```
- - —— CURRENT ACCOUNT - - ——

 Enter a name
 Mahgha
 Enter account no.
  AC501

 Enter the operation
 1, deposit the amount
 2, withdrawal amount
 3, display the details

 1,
 Enter the deposit amont
 20,000
 The amount 20000 is Sucessfull deposited,
  current balance is 20000

Enter the operation
2,
Enter the withdrawal amount
500
The amont 500 was withdrawal ; Currnt balae
```



```
Enter the operation
2.
Enter the withdrawal amount
14600
the amont 14600 withdrawal succest fully,
new balance is : 400.0
 Balance below minimum, Impose penalty of 50.0.
 New balance is 350.0.

Enter the operation
3.
Name : Mahesha
Account No : AC501
Account type : current
Balance : 350.0

------- Saving Account -------
Enter a Name and accont no
Mahesha
AC202
Enter the operation
1, deposite the amount
2, compute interest
3, withdrawal amount
4, display the details
1,
 Enter the deposit amont
 50000
 the amont 50000 Succesfull deposited
  current balance is 50000
Enter the operation
2,
 Interest of 2000 deposited, new balance 82000
```



```
Enter the opration
3.
Enter the withdrawal amount
20000
the amont 20000 is withdrawal Successfull
new balance: 32000.0

Enter the opration
4,

Name : Mahegha
accont no: AC201
Accont Type : Savings
Balance : 32000
```

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Code:

```
import java.util.*;
class Bank{
        String name;
        String accno;
        String acctype;
        double balance=0;
Bank(String name, String accno, String acctype){
        this.name=name;
        this.accno=accno;
        this.acctype=acctype;

}
```

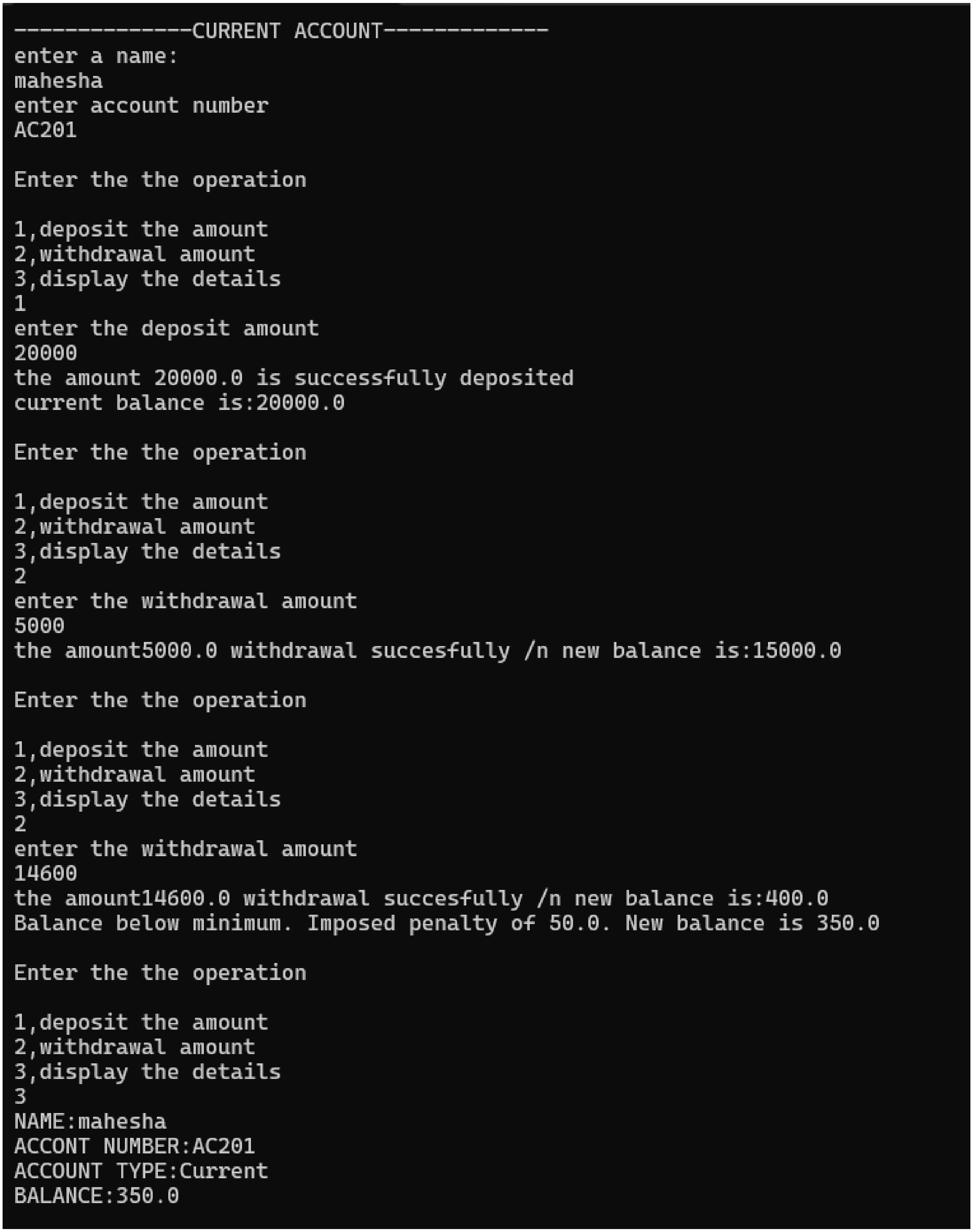
```
void deposit(double amount){
    balance=amount;
    System.out.println("the amount "+amount+" is successfully
deposited");
    System.out.println("current balance is:"+balance);
}
void display(){
    System.out.println("NAME:"+name);
    System.out.println("ACCONT NUMBER:"+accno);
    System.out.println("ACCOUNT TYPE:"+acctype);
    System.out.println("BALANCE:"+balance);
}
}
class curracc extends Bank{
    double minimumBalance = 1000;
    double penalty = 50;
curracc(String name, String accno){
    super(name, accno, "Current");
}
void withdraw(double amount){
    if (balance-amount < 0){
        System.out.println("influcient funds");
     }else{
        balance-=amount;
        System.out.println("the amount"+amount+" withdrawal
succesfully /n new balance is:"+balance);
}
checkMinimumBalance();
}
 void checkMinimumBalance() {
    if (balance < minimumBalance) {
     balance -= penalty;
     System.out.println("Balance below minimum. Imposed penalty of "
+ penalty + ". New balance is " + balance);
}
```

```
}
}

class saveacc extends Bank{
        double interestRate = 0.04;
saveacc(String name, String accno){
        super(name, accno, "savings");
}
void camputeintereast(){
        double interest=balance*interestRate;
        balance+=interest;
        System.out.println("Interest of " + interest + " deposited. \n New
balance is " + balance);
}
void withdraw(double amount){
        if (balance-amount < 0){
                System.out.println("influcient funds");
        }else{
                balance-=amount;
                System.out.println("the amount"+amount+" withdrawal
succesfully \n new balance  is:"+balance);
}
}
}
class bankacc{
public static void main(String args[]){

Scanner input=new Scanner(System.in);
boolean exit=false;
System.out.println("--------------CURRENT ACCOUNT-------------");
System.out.println("enter a name:");
String n=input.nextLine();
System.out.println("enter account number");
String a=input.nextLine();
curracc s=new curracc(n,a);
```

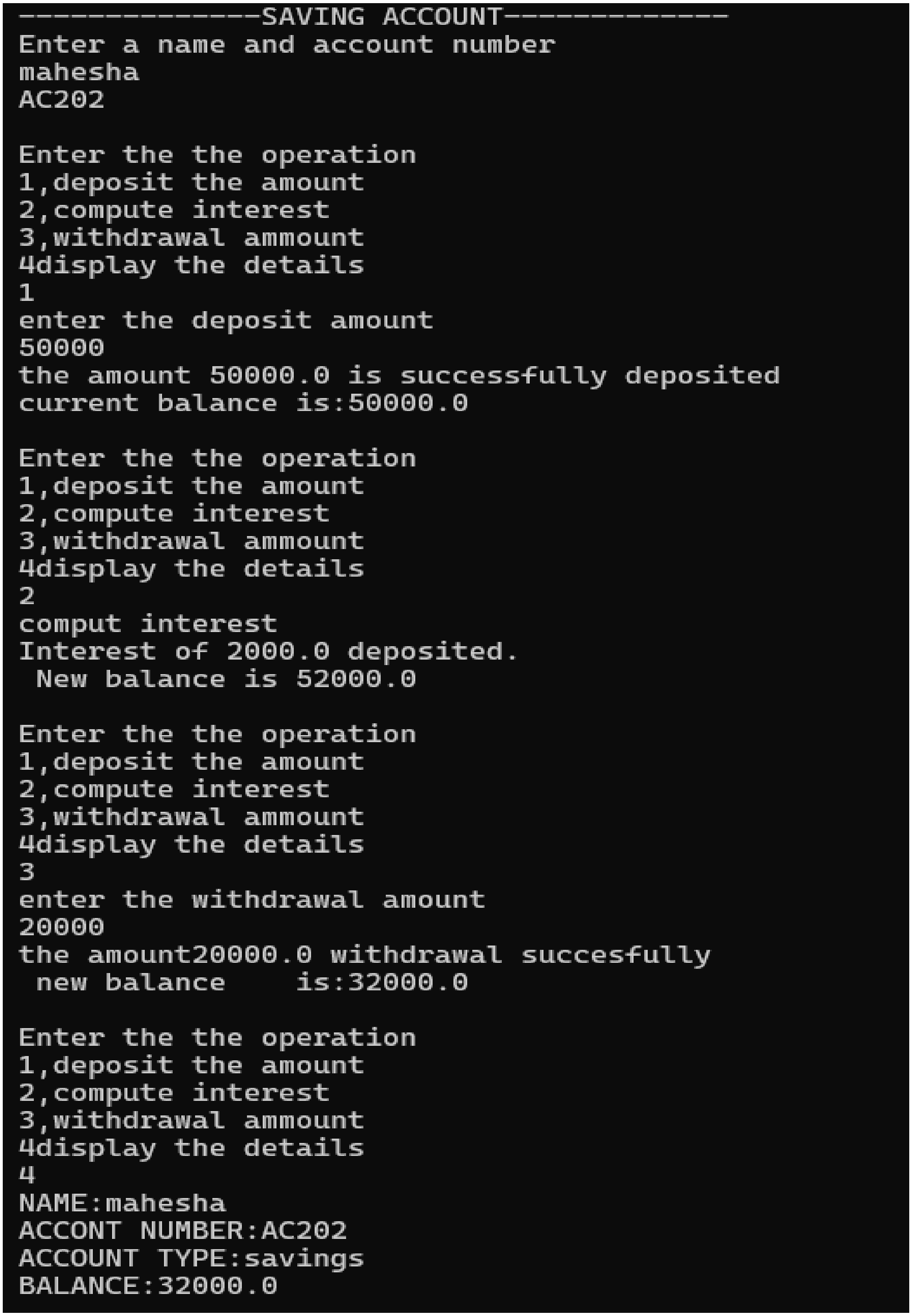
```
while(!exit){
System.out.println("\nEnter the the operation \n");
System.out.println("1,deposit the amount");
System.out.println("2,withdrawal amount");
System.out.println("3,display the details");
int ch=input.nextInt();
switch(ch){
        case 1:
                System.out.println("enter the deposit amount");
                double amount=input.nextDouble();
                s.deposit(amount);
                break;
        case 2:
                System.out.println("enter the withdrawal amount");
                double w=input.nextDouble();
                s.withdraw(w);
                break;
        case 3:
                s.display();
                break;
        case 4:
                System.out.println("invalid choice");
                exit=true;
}
}


System.out.println("--------------SAVING ACCOUNT-------------");
System.out.println("Enter a name and account number");
String n1=input.nextLine();
String n2=input.nextLine();
String a1=input.nextLine();

boolean exit1=false;
```

```
saveacc s1=new saveacc(n2,a1);
while(!exit1){
System.out.println("\nEnter the the operation");
System.out.println("1,deposit the amount");
System.out.println("2,compute interest");
System.out.println("3,withdrawal ammount");
System.out.println("4display the details");

int ch1=input.nextInt();
switch(ch1){
        case 1:
                System.out.println("enter the deposit amount");
                double amount1=input.nextDouble();
                s1.deposit(amount1);
                break;
        case 2:
                System.out.println("comput interest");
                s1.camputeintereast();
                break;
        case 3:
                System.out.println("enter the withdrawal amount");
                double w1=input.nextDouble();
                s1.withdraw(w1);
                break;
        case 4:
                s1.display();
                break;
        case 5:
                System.out.println("invalid choice");
                exit1=true;
}
}

}
}
```

OUTPUT:

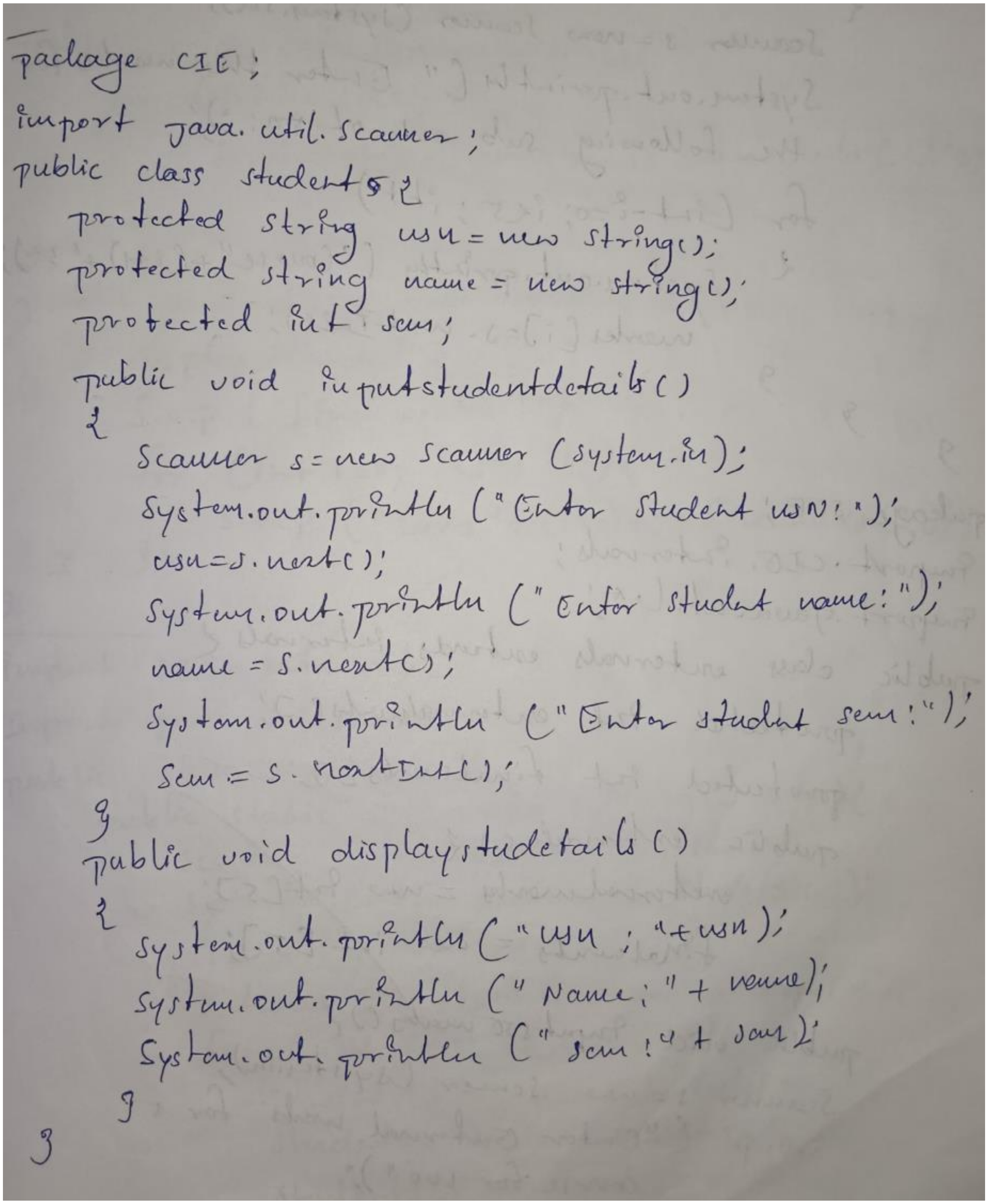


```
--------------CURRENT ACCOUNT-------------
enter a name:
mahesha
enter account number
AC201

Enter the the operation

1,deposit the amount
2,withdrawal amount
3,display the details
1
enter the deposit amount
20000
the amount 20000.0 is successfully deposited
current balance is:20000.0

Enter the the operation

1,deposit the amount
2,withdrawal amount
3,display the details
2
enter the withdrawal amount
5000
the amount5000.0 withdrawal succesfully /n new balance is:15000.0

Enter the the operation

1,deposit the amount
2,withdrawal amount
3,display the details
2
enter the withdrawal amount
14600
the amount14600.0 withdrawal succesfully /n new balance is:400.0
Balance below minimum. Imposed penalty of 50.0. New balance is 350.0

Enter the the operation

1,deposit the amount
2,withdrawal amount
3,display the details
3
NAME:mahesha
ACCONT NUMBER:AC201
ACCOUNT TYPE:Current
BALANCE:350.0
```

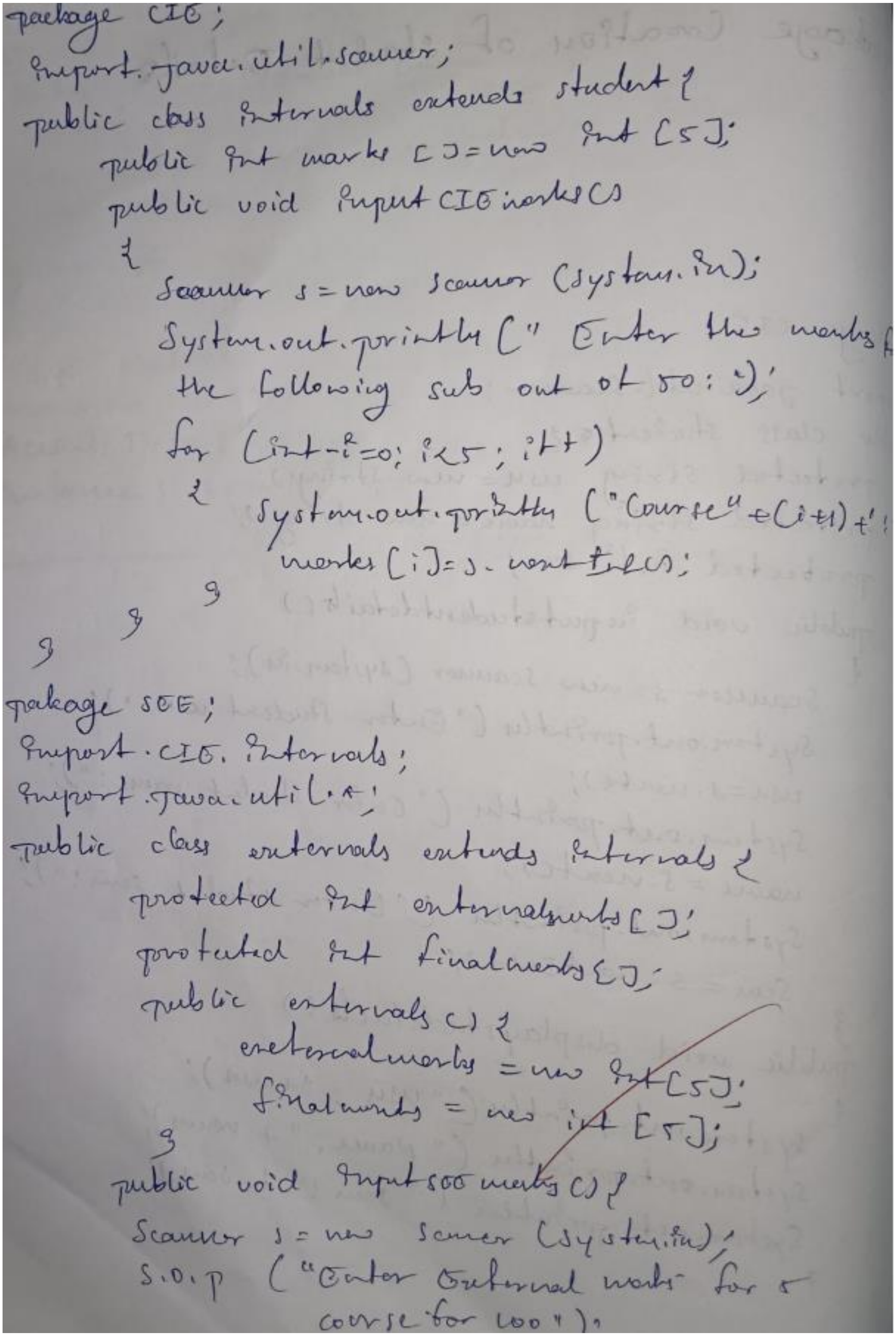


```
--------------SAVING ACCOUNT-------------
Enter a name and account number
mahesha
AC202

Enter the the operation
1,deposit the amount
2,compute interest
3,withdrawal ammount
4display the details
1
enter the deposit amount
50000
the amount 50000.0 is successfully deposited
current balance is:50000.0

Enter the the operation
1,deposit the amount
2,compute interest
3,withdrawal ammount
4display the details
2
comput interest
Interest of 2000.0 deposited.
 New balance is 52000.0

Enter the the operation
1,deposit the amount
2,compute interest
3,withdrawal ammount
4display the details
3
enter the withdrawal amount
20000
the amount20000.0 withdrawal succesfully
 new balance    is:32000.0

Enter the the operation
1,deposit the amount
2,compute interest
3,withdrawal ammount
4display the details
4
NAME:mahesha
ACCONT NUMBER:AC202
ACCOUNT TYPE:savings
BALANCE:32000.0
```

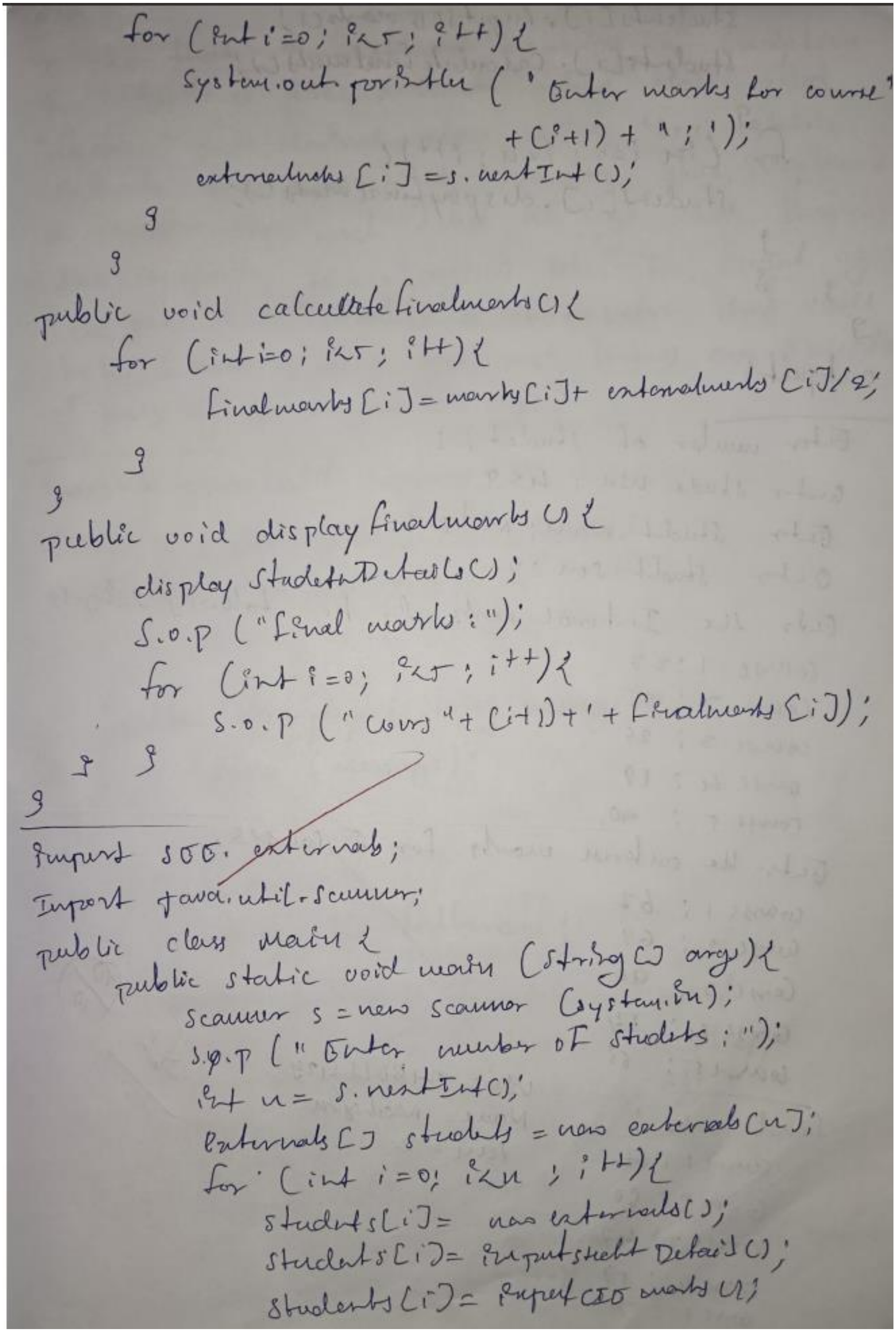
PROGRAM NO-6:
Packages
Algorithm:



```
package CIE ;
import java. util. scanner ;
public class students {
   protected string usn = new string();
   protected string name = new string();
   protected int sem;
   public void inputstudentdetails()
   {
      Scanner s = new scanner (system.in);
      System.out.println ("Entor Student usN: ");
      usn=s.next();
      System.out.println ("Entor studnt name:");
      name = s.next();
      System.out.println ("Entor studnt sem:");
      sem = s. nextInt();
   }
   public void displaystudetails()
   {
      system.out.println ("usn ; "+usn);
      system.out.println (" Name: " + name);
      System.out.println (" sem :" + sem);
   }
}
```

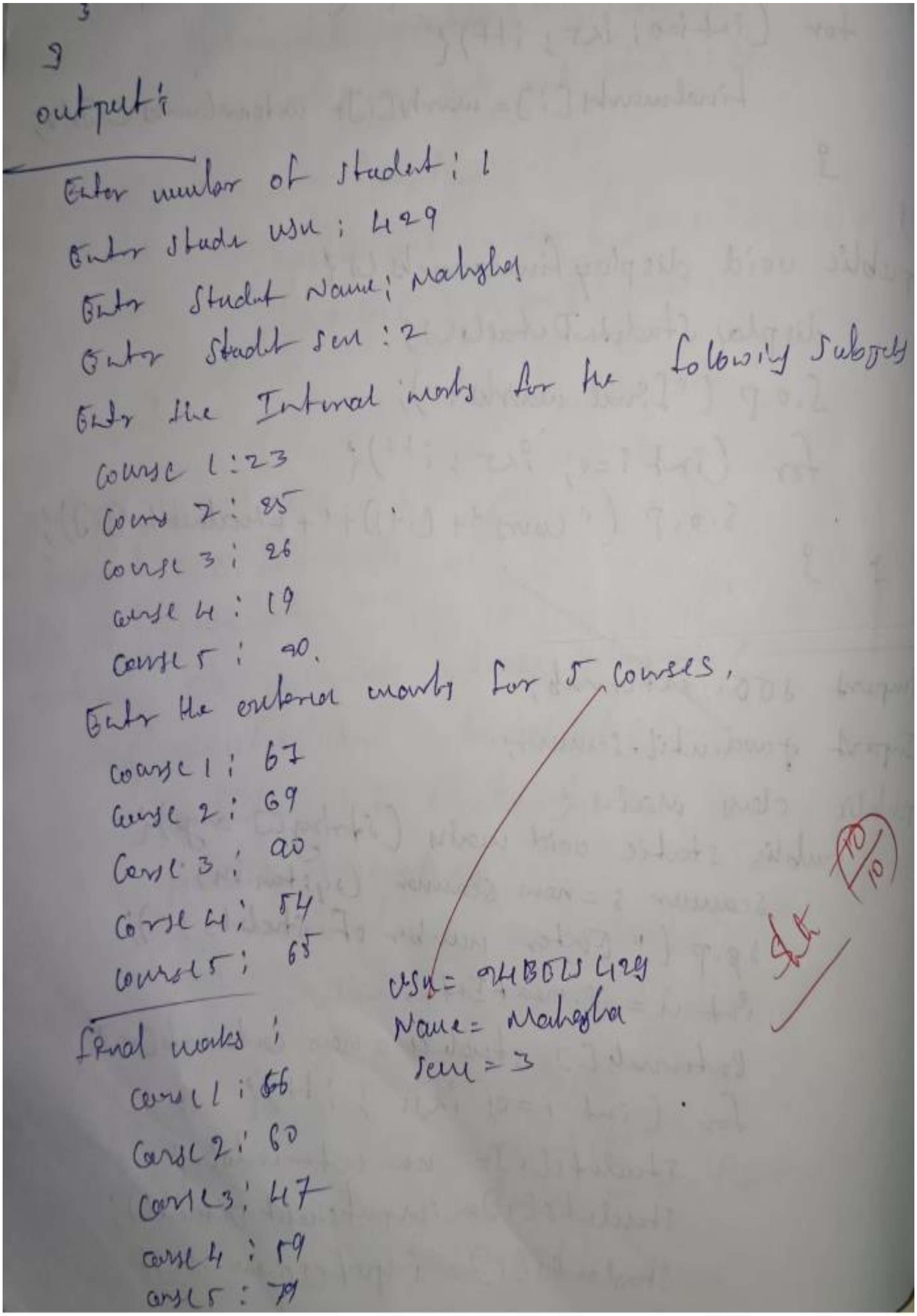


```
package CIE;
import.java.util.scanner;
public class Internals extends student {
    public int marks [] = new int [5];
    public void input CIEmarks()
    {
        Scanner s = new Scanner (system.in);
        System.out.println (" Enter the marks f
        the following sub out of 50: ");
        for (int i=0; i<5; i++)
        {
            System.out.println ("Course" +(i+1)+':
            marks [i] = s.nextInt();
        }
    }
}
package SEE;
import.CIE.Internals;
import.java.util.*;
public class externals extends internals {
    protected int externalmarks [];
    protected int finalmarks [];
    public externals () {
        externalmarks = new int [5];
        finalmarks = new int [5];
    }
    public void inputSEEmarks () {
    Scanner s = new Scanner (system.in);
    S.O.P ("Enter External marks for 5
    course for 100");
```



```
for (int i=0; i<5; i++){
    System.out.println ( ' Enter marks for course'
                        + (i+1) + " : ');
    externalmarks [i] =s. nextInt ();
  }
 }
public void calcultate finalmarks(){
  for (int i=0; i<5; i++){
      finalmarks [i] = marks[i]+ externalmarks [i]/2;

   }
 }
public void display finalmarks (){
    display StudentDetails();
    S.o.p ("final marks :");
    for (int i=0; i<5; i++){
        S.o.p ("Cours "+ (i+1)+' + finalmarks [i]);
  } }
}
```

```
import SEE. externals;
Import java.util.Scanner;
public class Main {
  public static void main (String[] args){
      Scanner s =new Scanner (System.in);
      S.o.p (" Enter number of students : ");
      int n= S.nextInt();
      Externals[] students = new externals[n];
      for (int i=0; i<n ; i++){
          students[i]= new externals();
          students[i]= inputstudentDetails();
          Students[i]= inputCIE marks ();
```



```
3
}
output:

Enter number of student: 1
Enter stude usn ; 429
Enter Student Name; Mahesha
Enter Student sem : 2
Enter the Internal marks for the following Subjects
 course 1:23
 course 2: 85
 course 3 ; 26
 course 4 : 19
 course 5 ; 90.
Enter the external marks for 5 courses,
 course 1 ; 67
 course 2 ; 69
 course 3 ; 90
 course 4 ; 54
 course 5 ; 65
Final marks ;                  USN = 24BCS 429
 course 1 ; 66                 Name = Mahesha
 course 2 ; 60                 sem = 3
 course 3 ; 47
 course 4 : 59
 course 5 : 79
```

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CODE:

CIE FILE

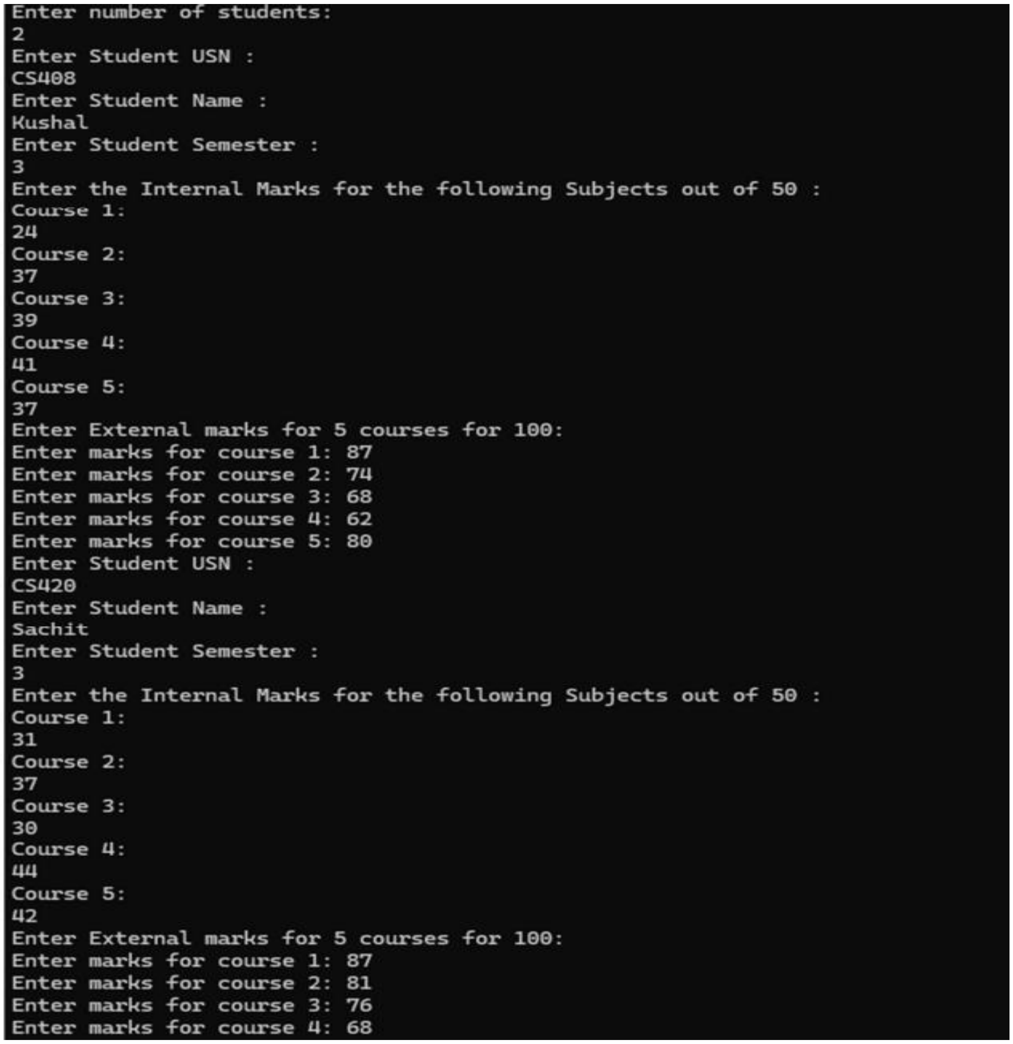
```
package CIE;
import java.util.Scanner;
public class internals extends student5{
        public int marks[] = new int[5];
        public void inputCIEmarks()
        {
                Scanner s=new Scanner(System.in);
                System.out.println("Enter the Internal Marks for the following
Subjects out of 50 :");
                for (int i=0;i<5;i++)
                {
                        System.out.println("Course "+(i+1)+":");
                        marks[i]=s.nextInt();
                }
        }
}
```

```
package CIE;
import java.util.Scanner;
public class student5{
        protected String usn = new String();
        protected String name = new String();
        protected int sem;
        public void inputStudentDetails()
        {
                Scanner s=new Scanner(System.in);
                System.out.println("Enter Student USN :");
                usn=s.next();
                System.out.println("Enter Student Name :");
                name=s.next();
                System.out.println("Enter Student Semester :");
                sem=s.nextInt();
        }
        public void displayStudentDetails()
        {
                System.out.println("USN of the Student : "+ usn);
                System.out.println("Name of the Student : "+ name);
                System.out.println("Semester of the Student : "+ sem);
        }
}
```

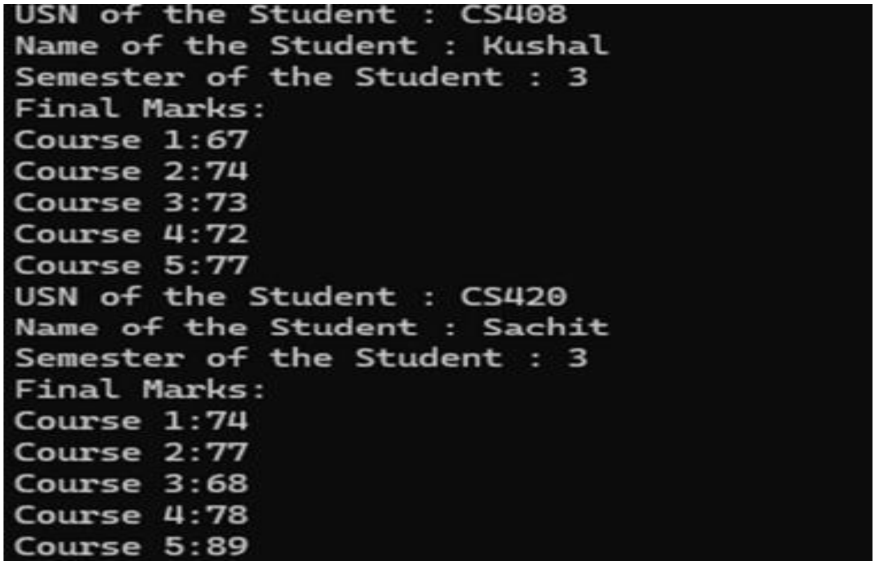
SEE FILE

```
package SEE;
import CIE.internals;
import java.util.Scanner;
public class externals extends internals {
        protected int externalmarks[];
        protected int finalMarks[];
        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 100: ");
       for (int i = 0; i < 5; i++) {
          System.out.print("Enter marks for course " + (i + 1) + ": ");
          externalmarks[i] = s.nextInt();
       }
        }
        public void calculateFinalMarks(){
                for (int i = 0; i < 5; i++) {
                        finalMarks[i] = marks[i] + externalmarks[i]/2;
                }
        }
        public void displayFinalMarks(){
                displayStudentDetails();
                System.out.println("Final Marks: ");
        for (int i = 0; i < 5; i++) {
                        System.out.println("Course "+(i+1)+":"+finalMarks[i]);
        }
        }
}

import SEE.externals;
import java.util.Scanner;
public class Main5{
    public static void main(String[] args) {
        Scanner s = new Scanner(System.in);
        System.out.println("Enter number of students: ");
       int n = s.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("Kushal Naidu N \n24BECS408");
}
}
```

OUTPUT:



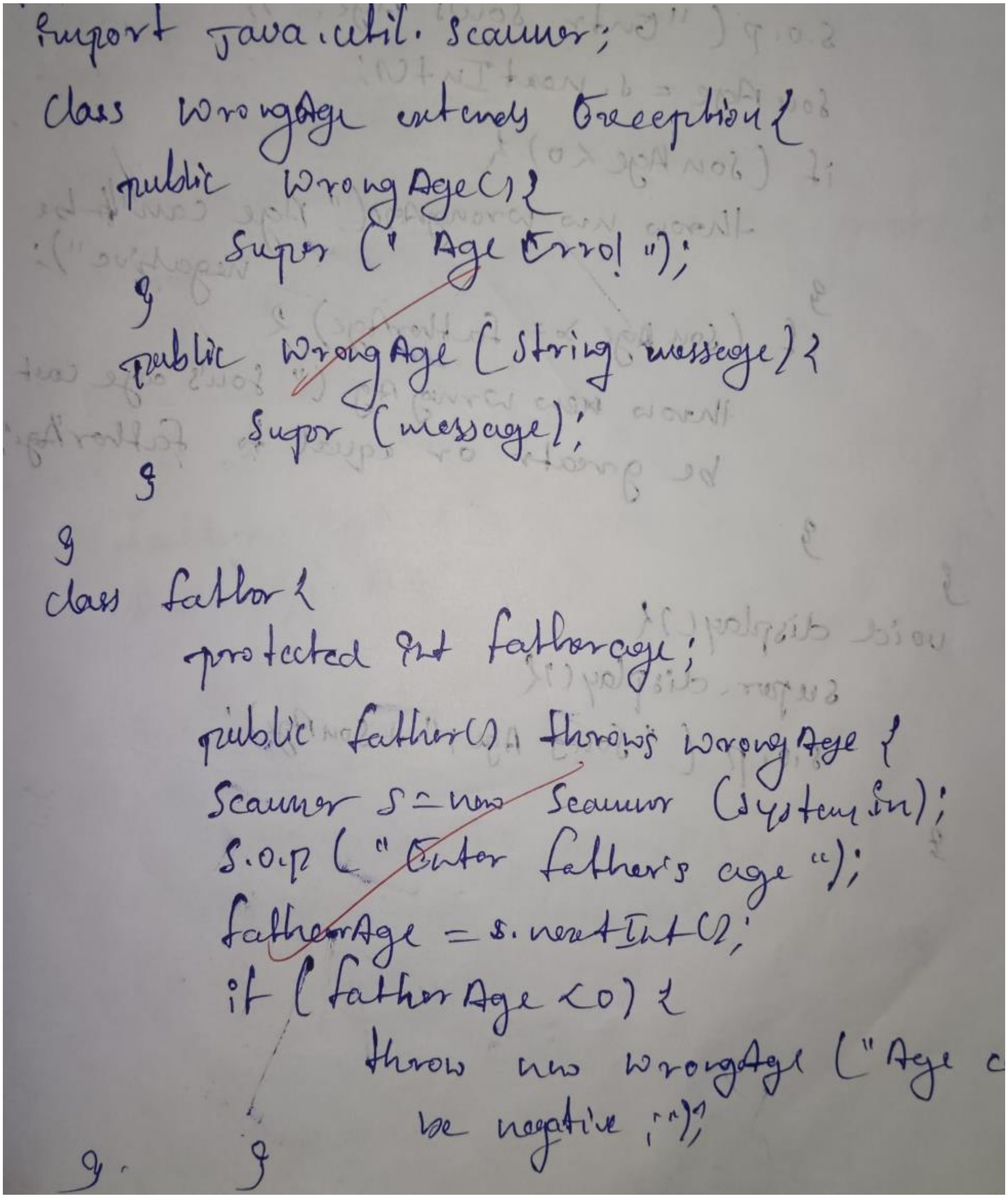
```
Enter number of students:
2
Enter Student USN :
CS408
Enter Student Name :
Kushal
Enter Student Semester :
3
Enter the Internal Marks for the following Subjects out of 50 :
Course 1:
24
Course 2:
37
Course 3:
39
Course 4:
41
Course 5:
37
Enter External marks for 5 courses for 100:
Enter marks for course 1: 87
Enter marks for course 2: 74
Enter marks for course 3: 68
Enter marks for course 4: 62
Enter marks for course 5: 80
Enter Student USN :
CS420
Enter Student Name :
Sachit
Enter Student Semester :
3
Enter the Internal Marks for the following Subjects out of 50 :
Course 1:
31
Course 2:
37
Course 3:
30
Course 4:
44
Course 5:
42
Enter External marks for 5 courses for 100:
Enter marks for course 1: 87
Enter marks for course 2: 81
Enter marks for course 3: 76
Enter marks for course 4: 68
```



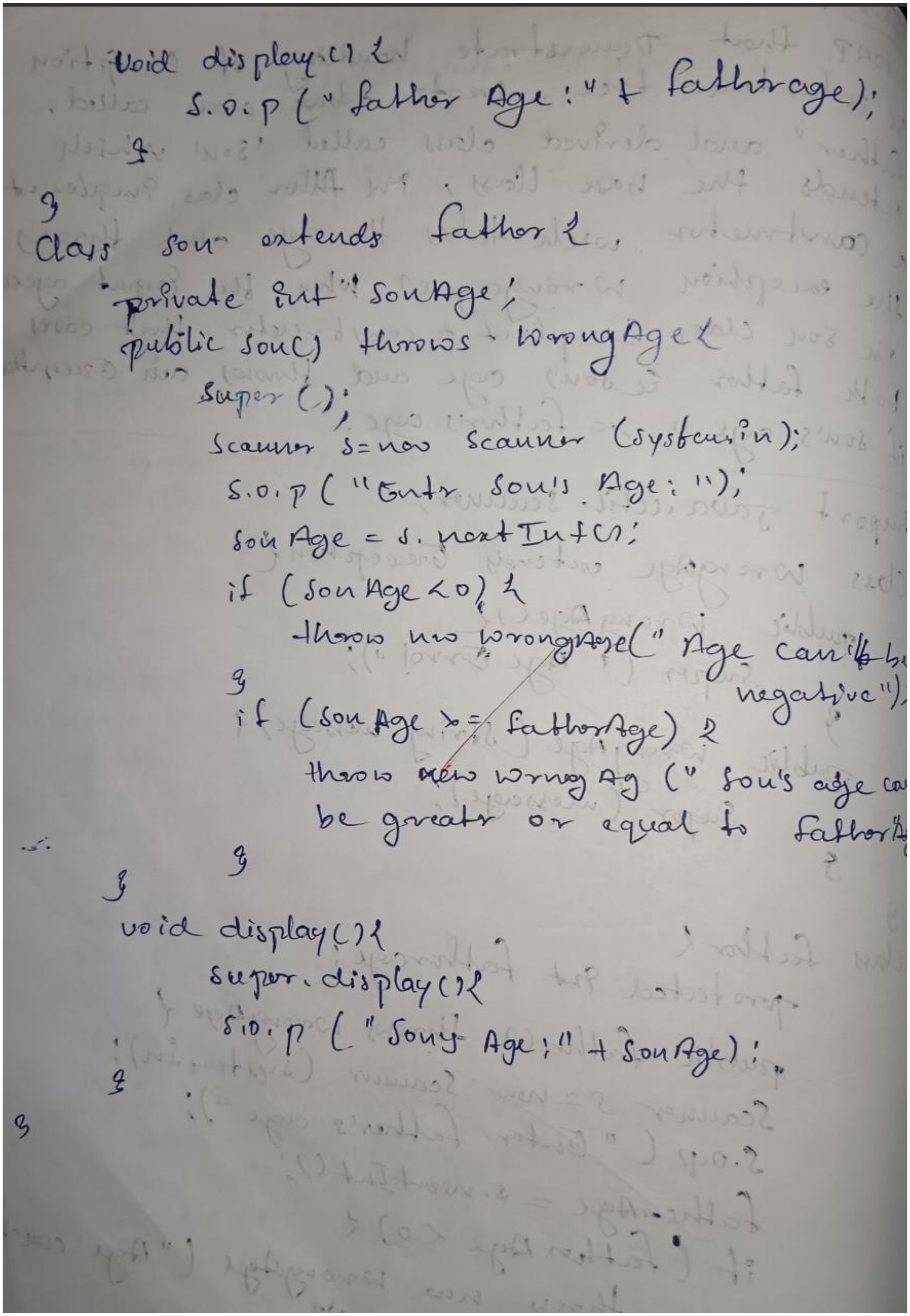
```
USN of the Student : CS408
Name of the Student : Kushal
Semester of the Student : 3
Final Marks:
Course 1:67
Course 2:74
Course 3:73
Course 4:72
Course 5:77
USN of the Student : CS420
Name of the Student : Sachit
Semester of the Student : 3
Final Marks:
Course 1:74
Course 2:77
Course 3:68
Course 4:78
Course 5:89
```

PROGRAM NO-7:
Exception Handling

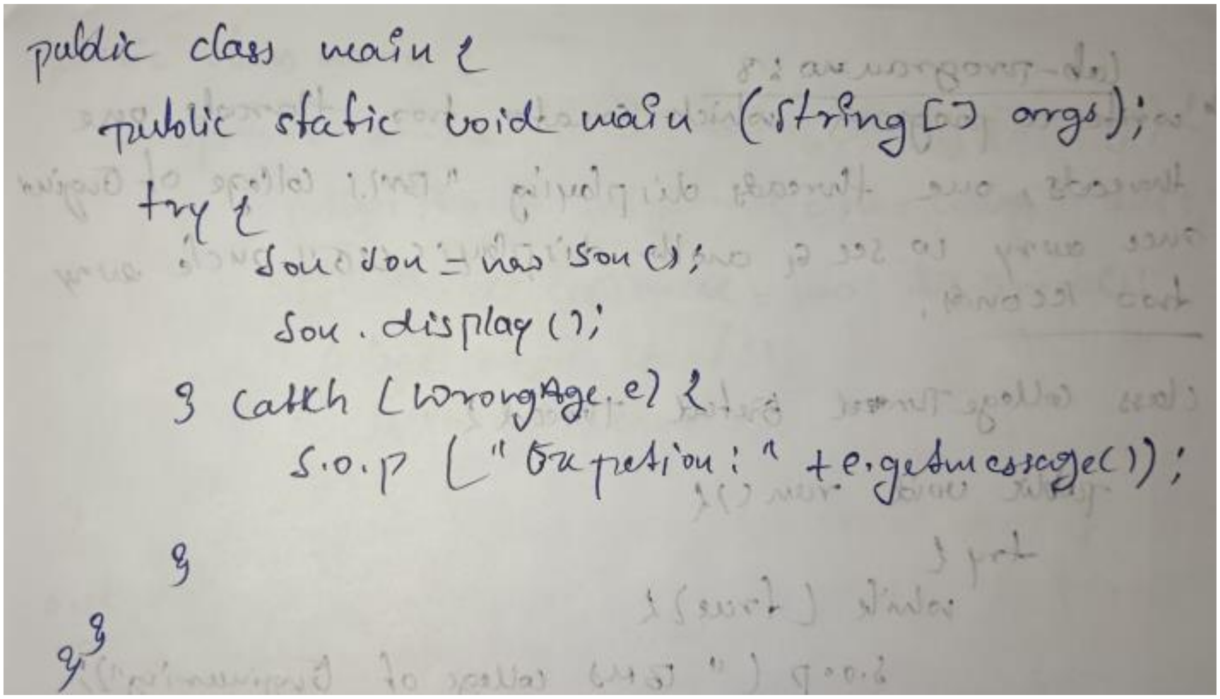
Algorithm:



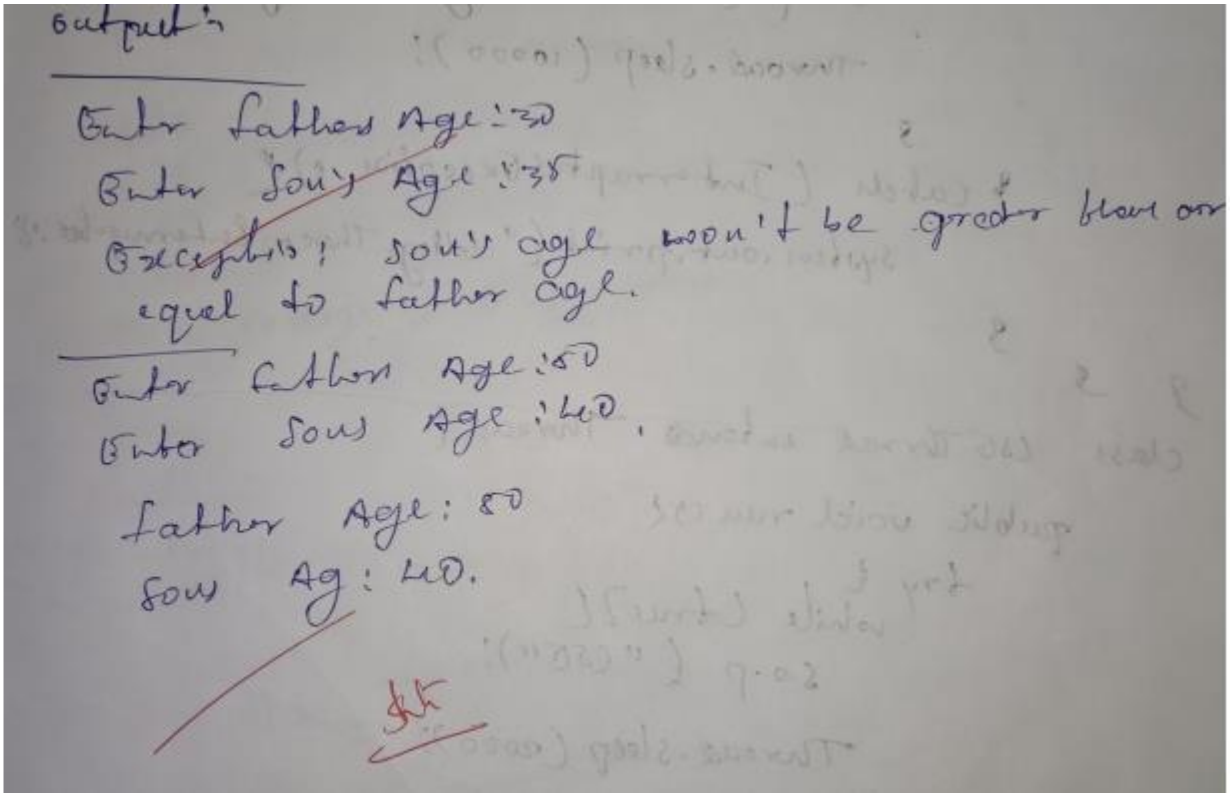
```
import java.util.Scanner;
class WrongAge extends Exception{
   public WrongAge(){
        Super ("Age Erro!");
   }
   public WrongAge(String message){
        Super (message);
   }
}
class father{
        protected int fatherage;
        public father() throws WrongAge {
        Scanner S = new Scanner (System.in);
        S.o.p ("Enter father's age ");
        fatherAge = S.nextInt();
        if (fatherAge <0) {
                throw new WrongAge ("Age c
                    be negative ;");
   }.        }
```



```
void display() {
    S.O.P (" father Age:" + fathrage);
  }
}
Class son extends father {
  private int sonAge;
  public son() throws WrongAge {
      Super();
      Scanner s=new Scanner (system.in);
       S.O.P ("Entr Son's Age: ");
       son Age = s. nextInt();
       if (son Age <0) {
           throw new WrongAge(" Age can't be
                                   negative");
       }
       if (son Age >= fatherAge) {
           throw new Wrong Ag (" Son's age ca
           be greater or equal to fatherA
       }
  }
  void display(){
      super.display()(
      S.O.P (" Sony Age:" + SonAge);
  }
}
```



```
public class main {
  public static void main (string [] args);
   try {
      Son son = new Son ();
      Son . display ();
   } catch (WrongAge e) {
      s.o.p ("Expetion : " + e.getmessage());

   }
}
}
```



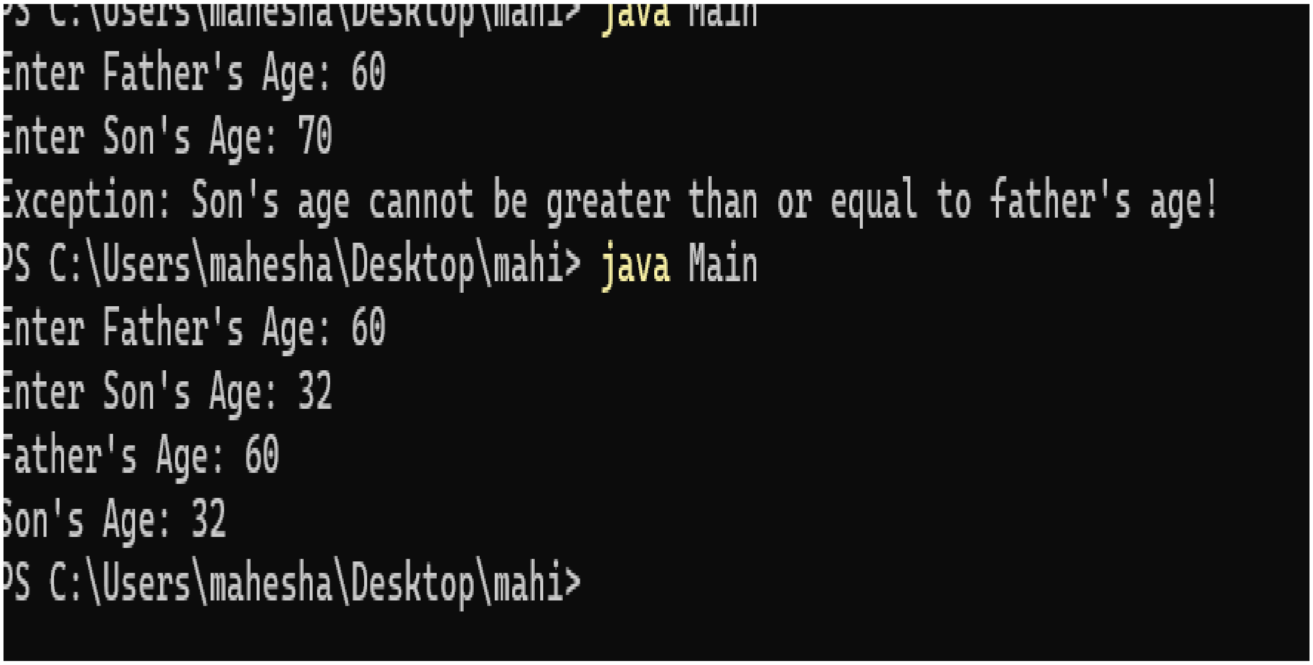
output :

```
Enter father Age: 30
 Enter Son's Age: 35
 Exception: Son's age won't be greater than or
  equal to father age.

Enter father Age: 50
Enter Sons Age: 40.

 father Age: 50
  Sow Ag: 40.
```

CODE:

```
import java.util.Scanner;

class WrongAge extends Exception {
    public WrongAge() {
        super("Age Error!");
    }

    public WrongAge(String message) {
        super(message);
    }
}

class Father {
    protected int fatherAge;

    public Father() throws WrongAge {
        Scanner s = new Scanner(System.in);
        System.out.print("Enter Father's Age: ");
        fatherAge = s.nextInt();
        if (fatherAge < 0) {
            throw new WrongAge("Age cannot be negative!");
        }
    }

    public void display() {
        System.out.println("Father's Age: " + fatherAge);
    }
}

class Son extends Father {
    private int sonAge;

    public Son() throws WrongAge {
        super();
        Scanner s = new Scanner(System.in);
        System.out.print("Enter Son's Age: ");
        sonAge = s.nextInt();
        if (sonAge < 0) {
            throw new WrongAge("Age cannot be negative!");
        }
        if (sonAge >= fatherAge) {
            throw new WrongAge("Son's age cannot be greater than or equal to father's age!");
        }
    }

    public void display() {
        super.display();
        System.out.println("Son's Age: " + sonAge);
    }
}

public class Main {
    public static void main(String[] args) {
        try {
            Son son = new Son();
            son.display();
        } catch (WrongAge e) {
            System.out.println("Exception: " + e.getMessage());
        }
    }
}
```

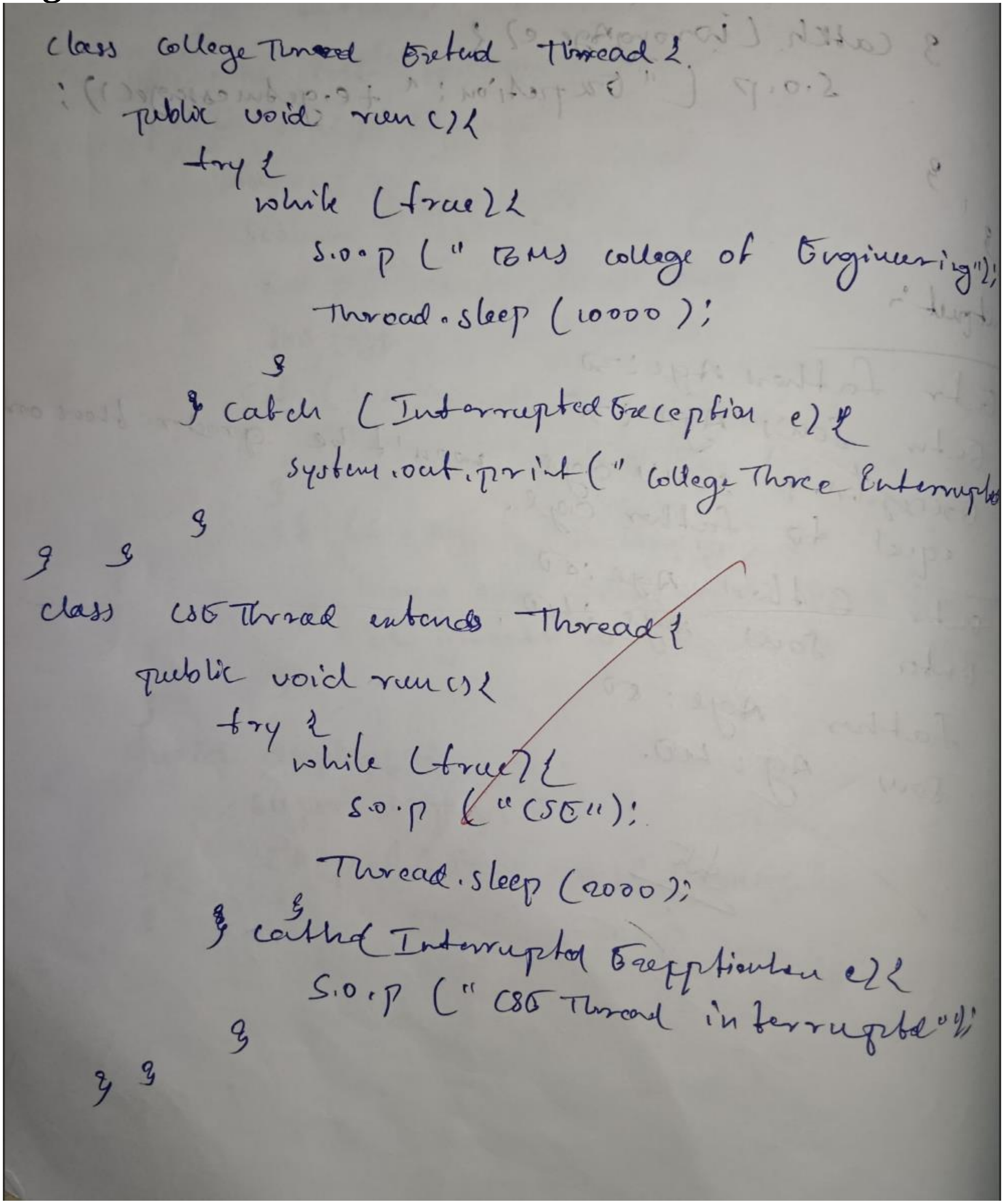
OUTPUT:



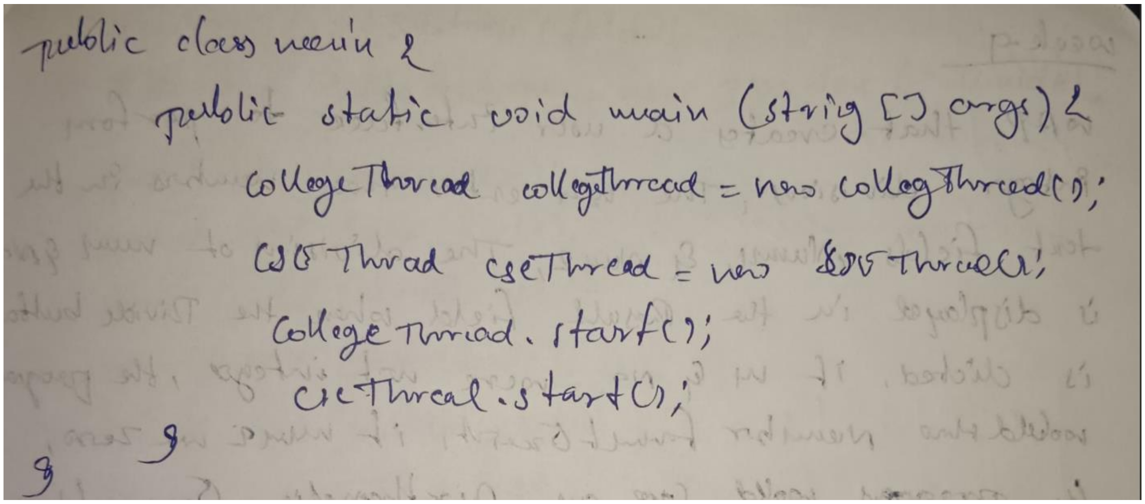
```
PS C:\Users\mahesha\Desktop\mahi> java Main
Enter Father's Age: 60
Enter Son's Age: 70
Exception: Son's age cannot be greater than or equal to father's age!
PS C:\Users\mahesha\Desktop\mahi> java Main
Enter Father's Age: 60
Enter Son's Age: 32
Father's Age: 60
Son's Age: 32
PS C:\Users\mahesha\Desktop\mahi>
```

PROGRAM NO-8:
Multi-Threading

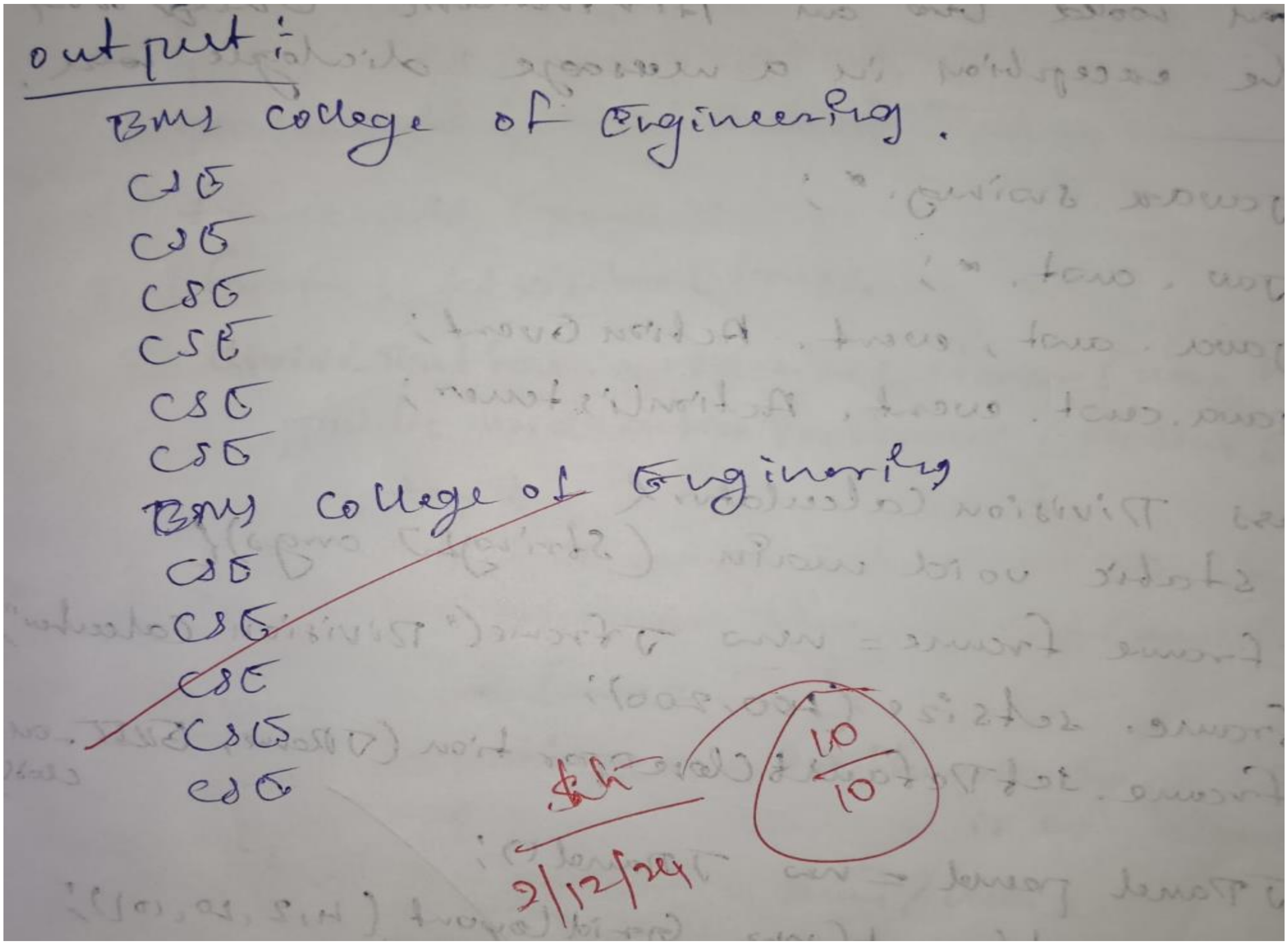
Algorithm:



```
class collegeThread Extend Thread {
   public void run(){
      try {
         while (true){
            s.o.p (" BMS college of Engineering");
            Thread.sleep (10000);
         }
      } catch (InterruptedException e){
         system.out.print(" College Three Interrupte
      }
} }
class CSEThread extends Thread{
   public void run(){
      try {
         while (true){
            s.o.p ("CSE");
         Thread.sleep (2000);
         }
      } catch(Interrupted Exception e){
         S.o.p (" CSE Thread interrupted");
      }
} }
```



```
public class main {
    public static void main (string [] args) {
        collegeThread collegthread = new collegThread();
        CSE Thrad cseThread = new CSE Thread();
        collegeThread.start();
        cseThread.start();
    }
}
```



output :

```
BMS college of Engineering.
CSE
CSE
CSE
CSE
CSE
CSE
BMS college of Enginering
CSE
CSE
CSE
CSE
CSE
```

10/10

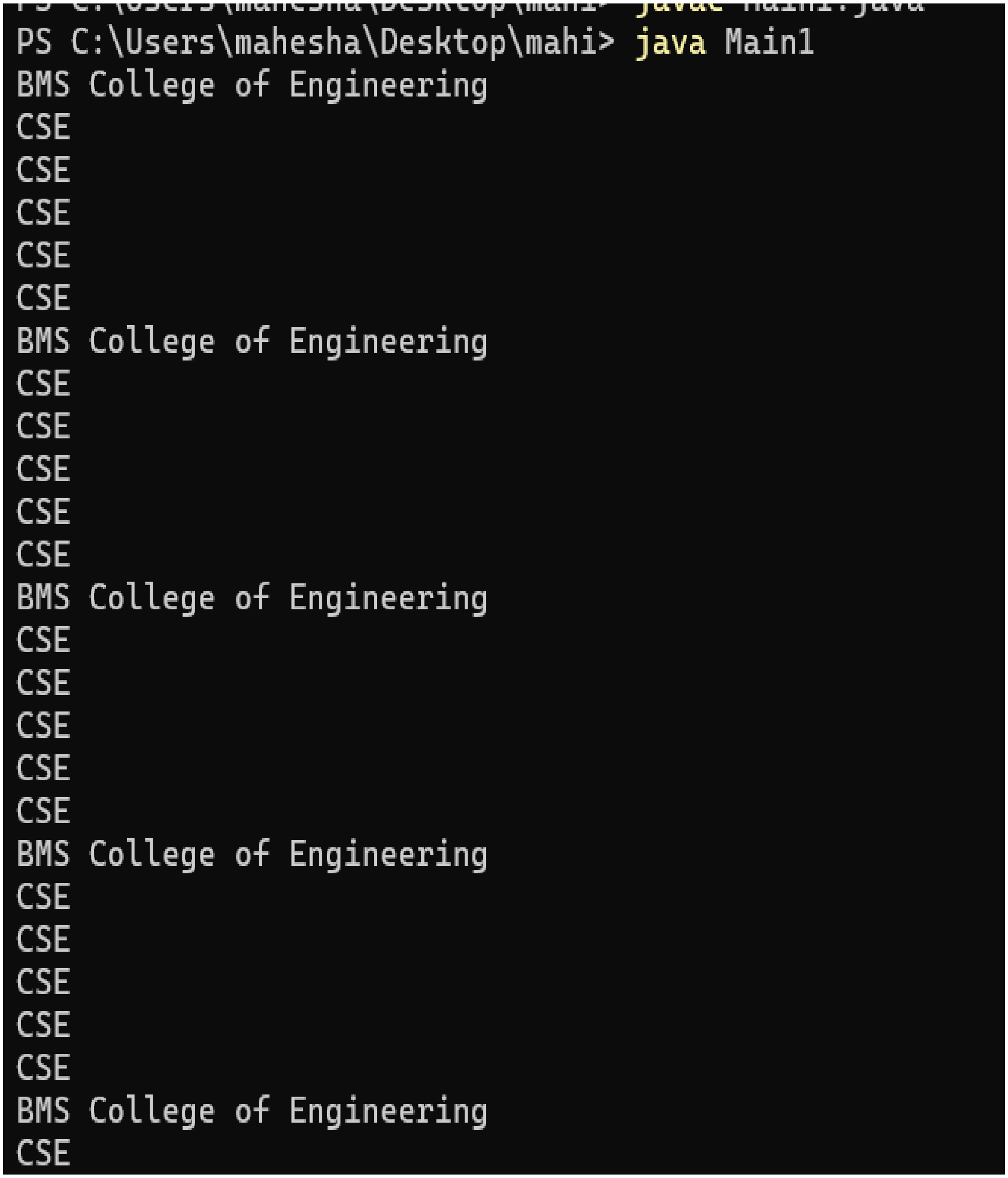
2/12/24

CODE:

```
class CollegeThread extends Thread {
    public void run() {
        try {
            while (true) {
                System.out.println("BMS College of Engineering");
                Thread.sleep(10000);
            }
        } catch (InterruptedException e) {
            System.out.println("CollegeThread interrupted.");
        }
    }
}
class CSEThread extends Thread {
    public void run() {
        try {
            while (true) {
                System.out.println("CSE");
                Thread.sleep(2000);
            }
        } catch (InterruptedException e) {
            System.out.println("CSEThread interrupted.");
        }
    }
}

public class Main {
    public static void main(String[] args) {
        CollegeThread collegeThread = new CollegeThread();
        CSEThread cseThread = new CSEThread();
        collegeThread.start();
        cseThread.start();
    }
```

}

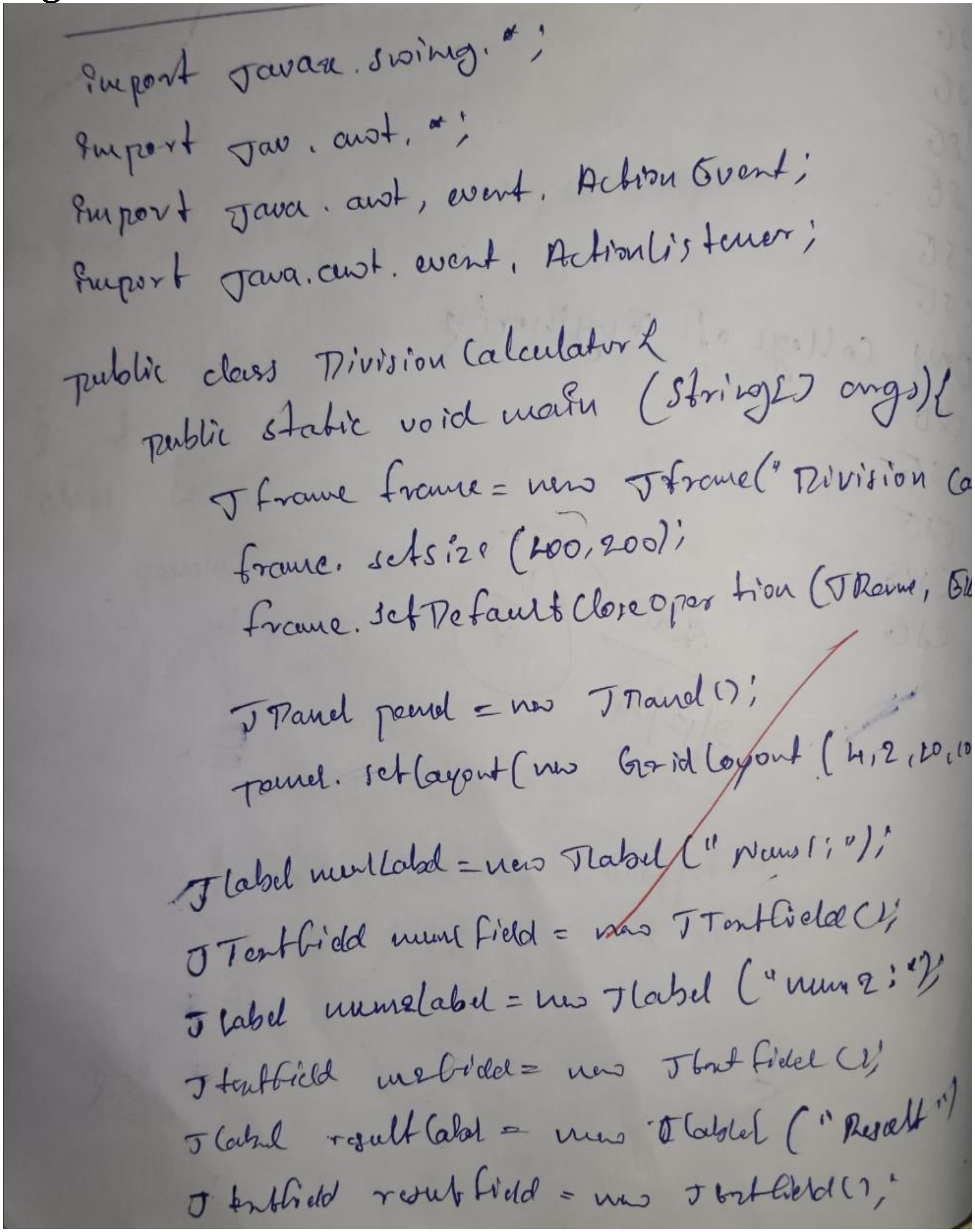
OUTPUT:



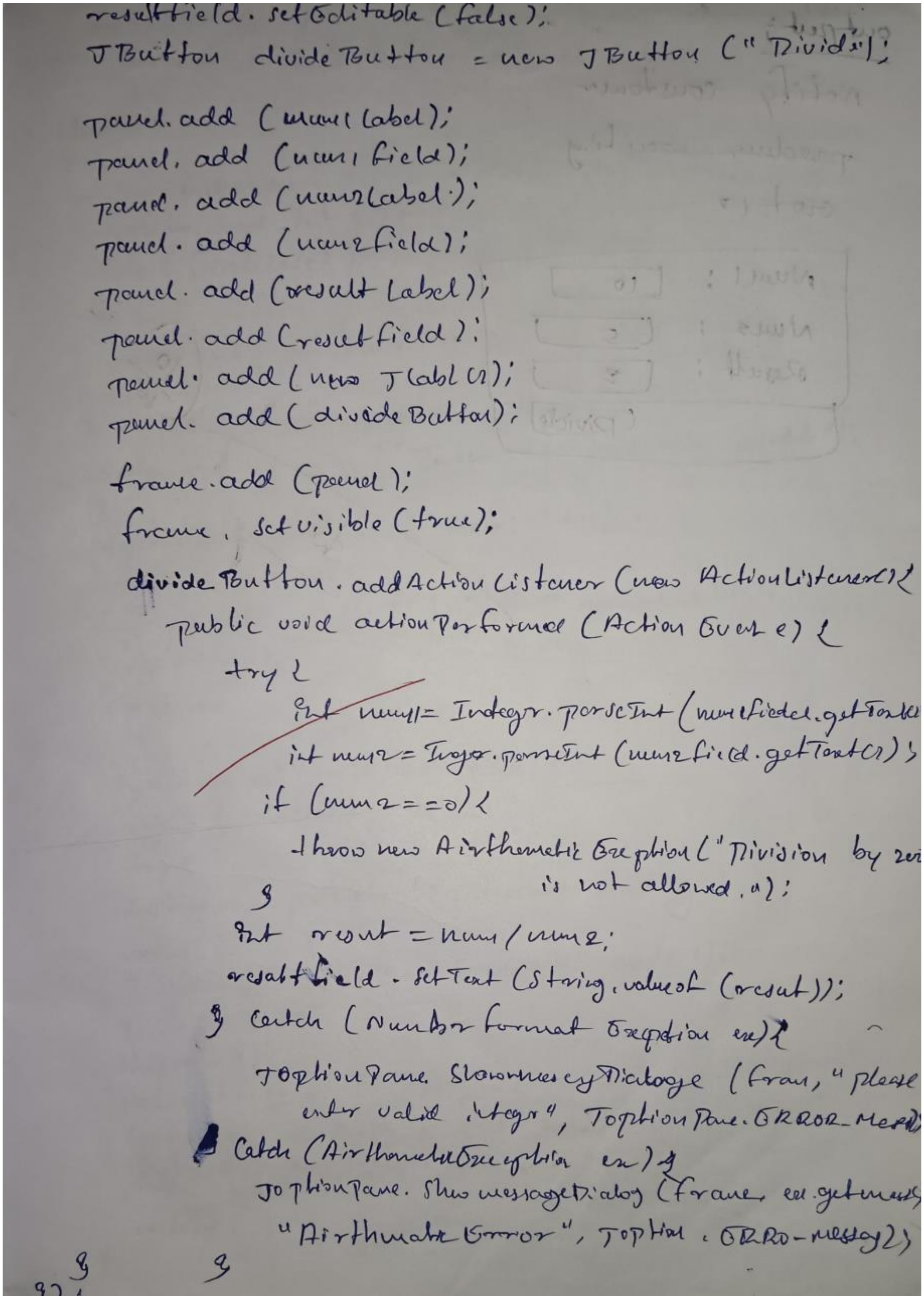
```
PS C:\Users\mahesha\Desktop\mahi> javac Main1.java
PS C:\Users\mahesha\Desktop\mahi> java Main1
BMS College of Engineering
CSE
CSE
CSE
CSE
CSE
BMS College of Engineering
CSE
CSE
CSE
CSE
CSE
BMS College of Engineering
CSE
CSE
CSE
CSE
CSE
BMS College of Engineering
CSE
CSE
CSE
CSE
CSE
BMS College of Engineering
CSE
```

PROGRAM NO-9:
Graphical User Interface

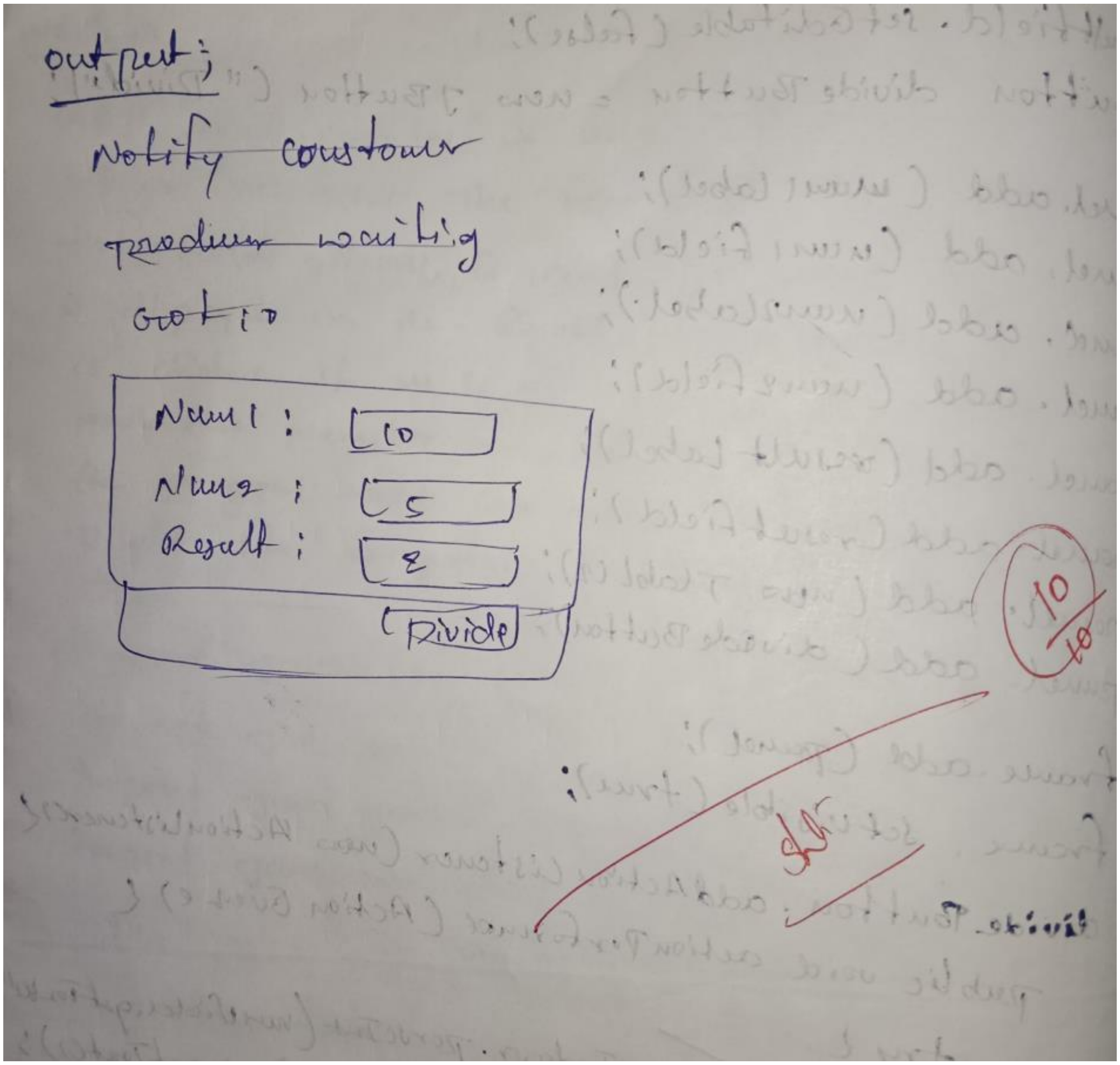
Algorithm:



```
import javax.swing.*;
import jav.awt.*;
import java.awt, event. ActionEvent;
import java.awt. event. Actionlistener;

public class Division Calculator{
    public static void main (String[] args){
        J frame frame = new Jframe(" Division Ca
        frame. setsize (400,200);
        frame. setDefault CloseOpera tion (JFrame, EX

        JPanel panel = new JPanel();
        panel. setLayout(new GridLayout (4,2,10,10

    Jlabel num1Label = new Jlabel (" Num1;");
    JTextfield num1 field = new JTextField();
    J label num2label = new Jlabel ("num2:");
    J textfield num2field= new Jtext fidel ();
    J label resultLabel = new Jlablel ("Result")
    J textfield resultfield = new Jtextfield();
```



```
resultField. setEditable (false);
JButton divideButton = new JButton ("Divide");

panel. add (num1 label);
panel. add (num1 field);
panel. add (num2label);
panel. add (num2field);
panel. add (result Label);
panel. add (resultfield);
panel. add (new Jlabl ());
panel. add (divideButton);

frame. add (panel);
frame. setvisible (true);

divideButton. addActionListener (new ActionListener() {
    public void actionPerformed (Action Event e) {
        try {
            int num1= Integer. parseInt (num1fieldl.getText
            int num2= Inteqr. parseInt (num2field.getText());
          if (num2==0) {
            throw new Airthemetic Exception ("Division by zer
                                    is not allowed.");
          }
        int result = num1 / num2;
        resultField. setText (String. valueof (result));
       } catch (Number format Exception ex){
         JOptionPane. ShowmessegDialoge (fram, "please
            enter valid integr", JOptionPane.ERROR_MESS
       } Catch (AirthemeticException ex) {
         JOptionPane. ShowmessageDialog (frame, ex.getmess
          "Airthmatic Error", JOption . ERRO-Messag);
  }        }
});
```



output;

~~Notify coustomer~~

~~Produer~~ waiting

Got 10

Num1 : 10

Num2 : 5

Result : 2

Divide

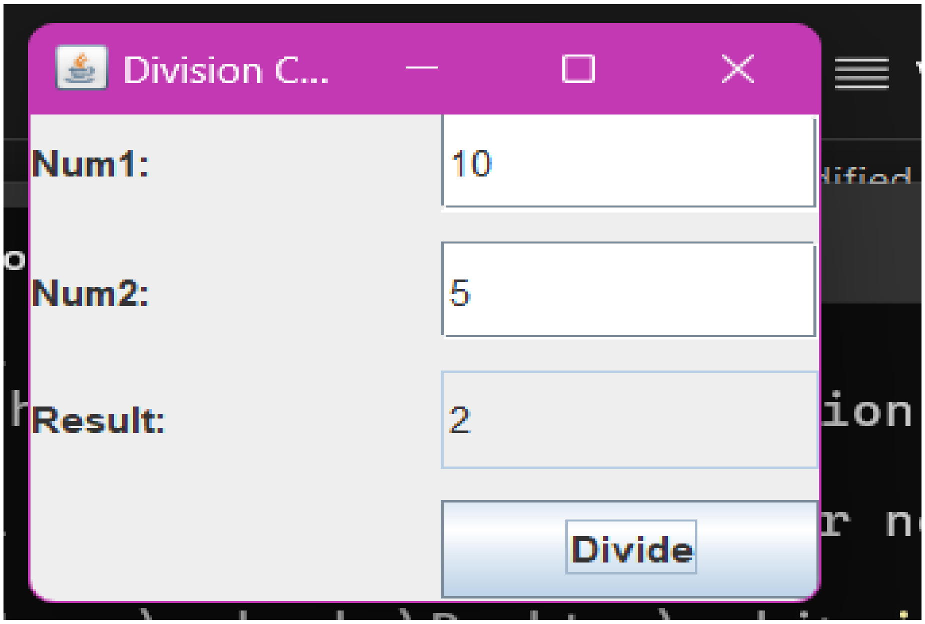
10/10

CODE:

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

public class DivisionCalculator {
    public static void main(String[] args) {
        JFrame frame = new JFrame("Division Calculator");
```

```
frame.setSize(400, 200);
frame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);

JPanel panel = new JPanel();
panel.setLayout(new GridLayout(4, 2, 10, 10));

JLabel num1Label = new JLabel("Num1:");
JTextField num1Field = new JTextField();
JLabel num2Label = new JLabel("Num2:");
JTextField num2Field = new JTextField();
JLabel resultLabel = new JLabel("Result:");
JTextField resultField = new JTextField();
resultField.setEditable(false);
JButton divideButton = new JButton("Divide");

panel.add(num1Label);
panel.add(num1Field);
panel.add(num2Label);
panel.add(num2Field);
panel.add(resultLabel);
panel.add(resultField);
panel.add(new JLabel());
panel.add(divideButton);

frame.add(panel);
frame.setVisible(true);

divideButton.addActionListener(new ActionListener() {
    @Override
    public void actionPerformed(ActionEvent e) {
        try {
            int num1 = Integer.parseInt(num1Field.getText());
            int num2 = Integer.parseInt(num2Field.getText());
            if (num2 == 0) {
                throw new ArithmeticException("Division by zero is not
allowed.");
                    }
                    int result = num1 / num2;
                    resultField.setText(String.valueOf(result));
                } catch (NumberFormatException ex) {
                    JOptionPane.showMessageDialog(frame, "Please enter valid
integers.", "Input Error", JOptionPane.ERROR_MESSAGE);
                } catch (ArithmeticException ex) {
                    JOptionPane.showMessageDialog(frame, ex.getMessage(),
"Arithmetic Error", JOptionPane.ERROR_MESSAGE);
                }
            }
        });
    }
}
```

OUTPUT:



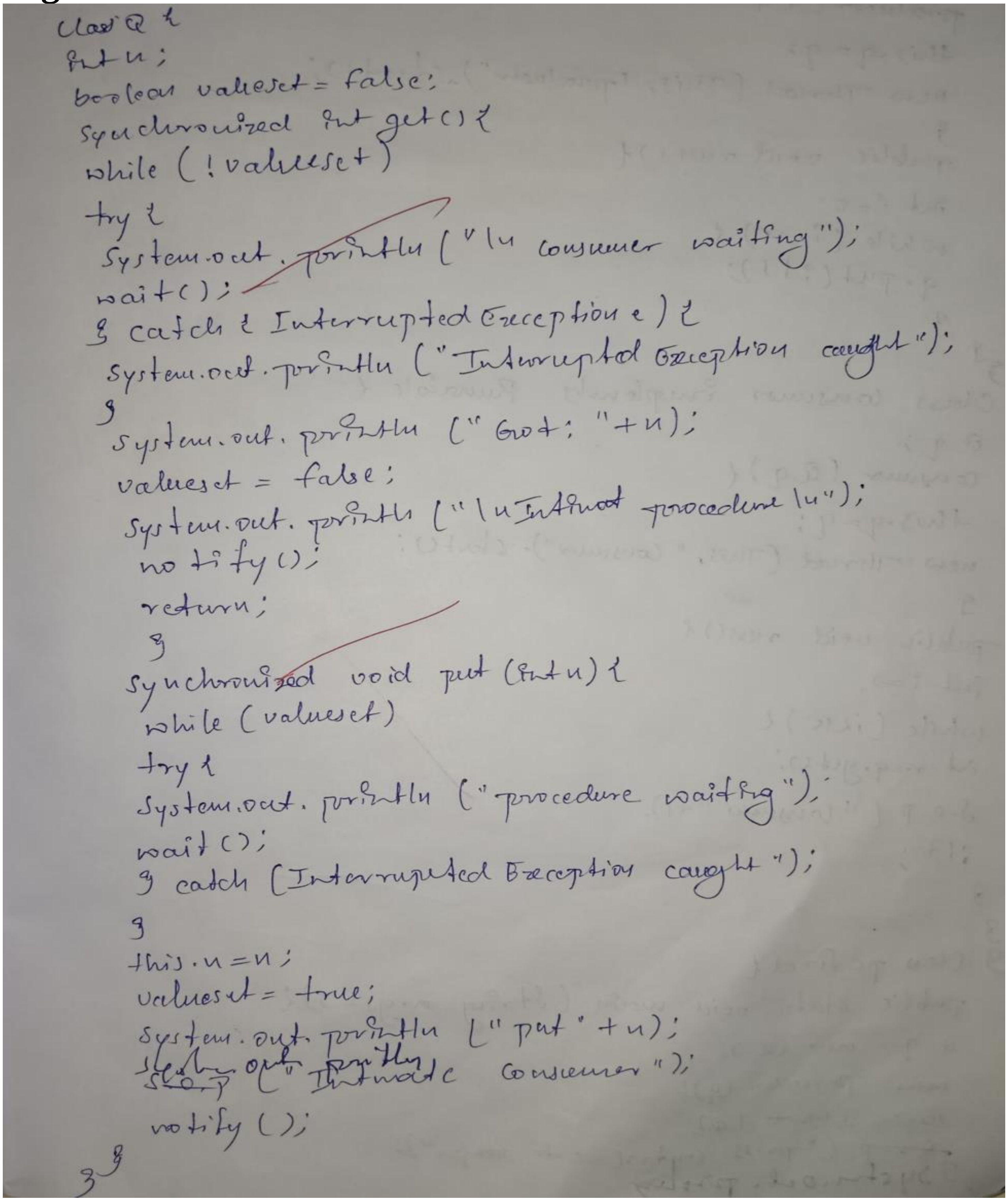
Num1: 10

Num2: 5

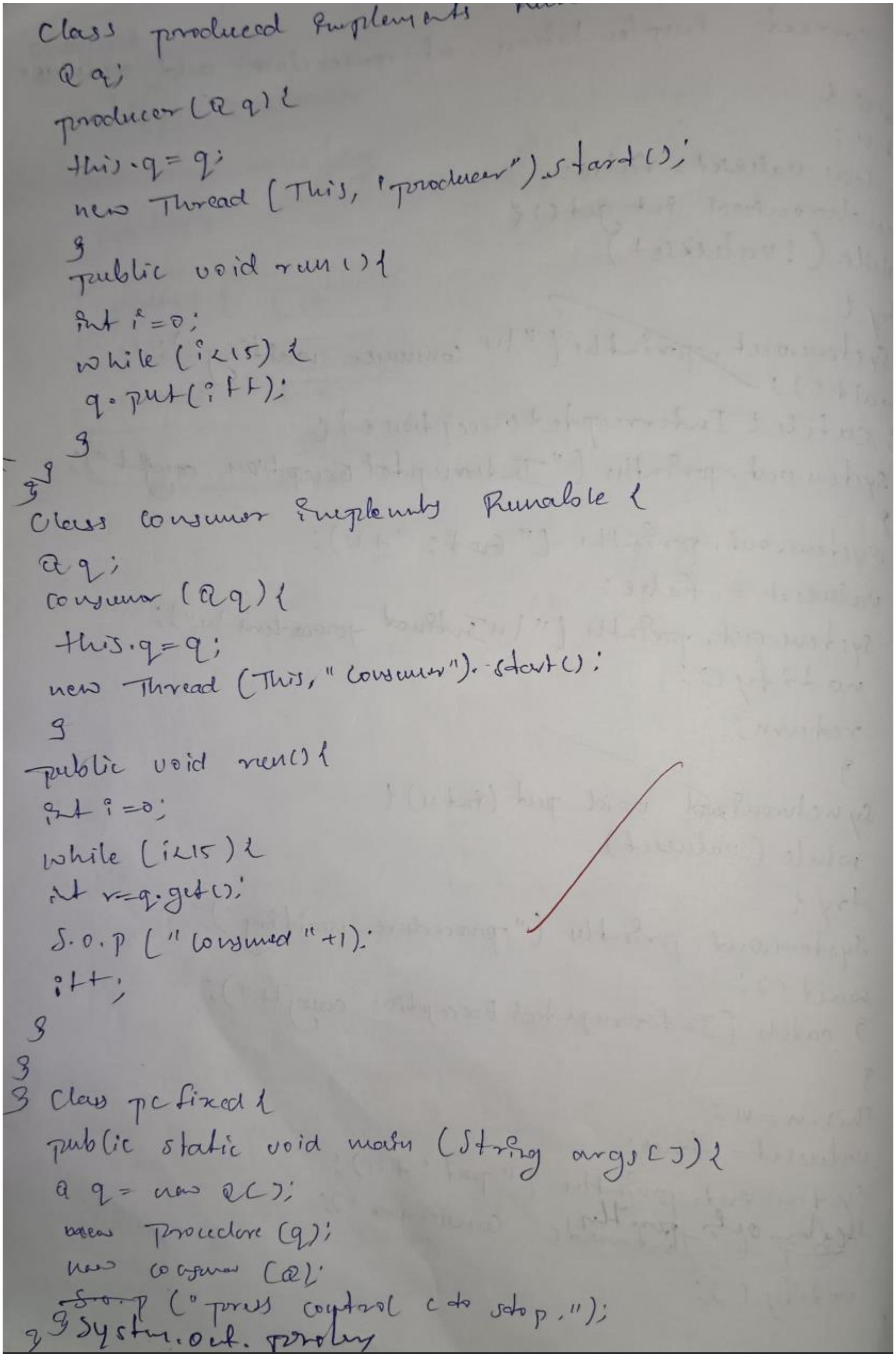
Result: 2

PROGRAM NO-10A:
Demonstrate Inter Process Communication

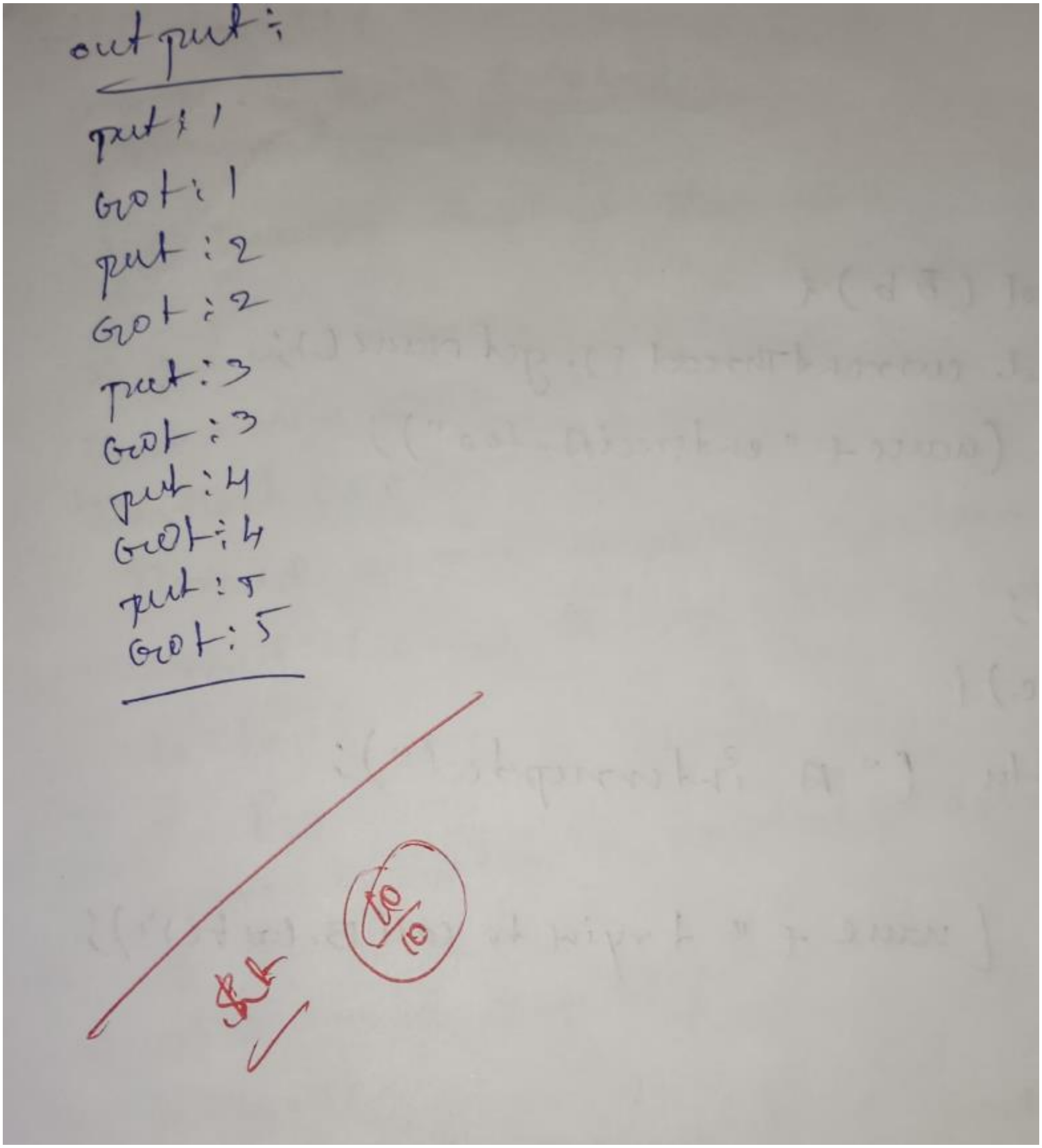
Algorithm:



```
class Q {
int n;
boolean valueset = false;
synchronized int get() {
while (!valueset)
try {
System.out.println ("\n consumer waiting");
wait();
} catch { InterruptedException e ) {
System.out.println ("InterruptedException caught");
}
System.out.println (" Got: "+n);
valueset = false;
System.out.println ("\nIntimate procedure \n");
 notify();
 return;
 }
synchronized void put (int n) {
 while (valueset)
try {
System.out.println ("procedure waiting");
wait();
} catch (InterruptedException caught ");
}
this.n=n;
valueset= true;
System.out.println ("put " +n);
System.out.println
S.o.p ("Intimate consumer");
 notify();
}}
```



```
Class produced implements Ru
 Q q;
 producer (Q q){
  this.q=q;
  new Thread (This, "producer").start();
  }
  public void run(){
  int i=0;
  while (i<15) {
   q.put(i++);
  }
 }
}
Class consumer implements Runable {
 Q q;
 consumer (Qq){
  this.q=q;
 new Thread (This, "Consumer").start();
  }
 public void run(){
  int i=0;
  while (i<15){
  int r=q.get();
  S.o.p ("consumed "+1);
  i++;
 }
}
} Class pcfixed {
  public static void main (String args[]){
  Q q= new Q();
  new Procedure (q);
  new consumer (Q);
  ~~S.o.p~~ ("press control c to stop.");
} } System.out.printly
```



output:

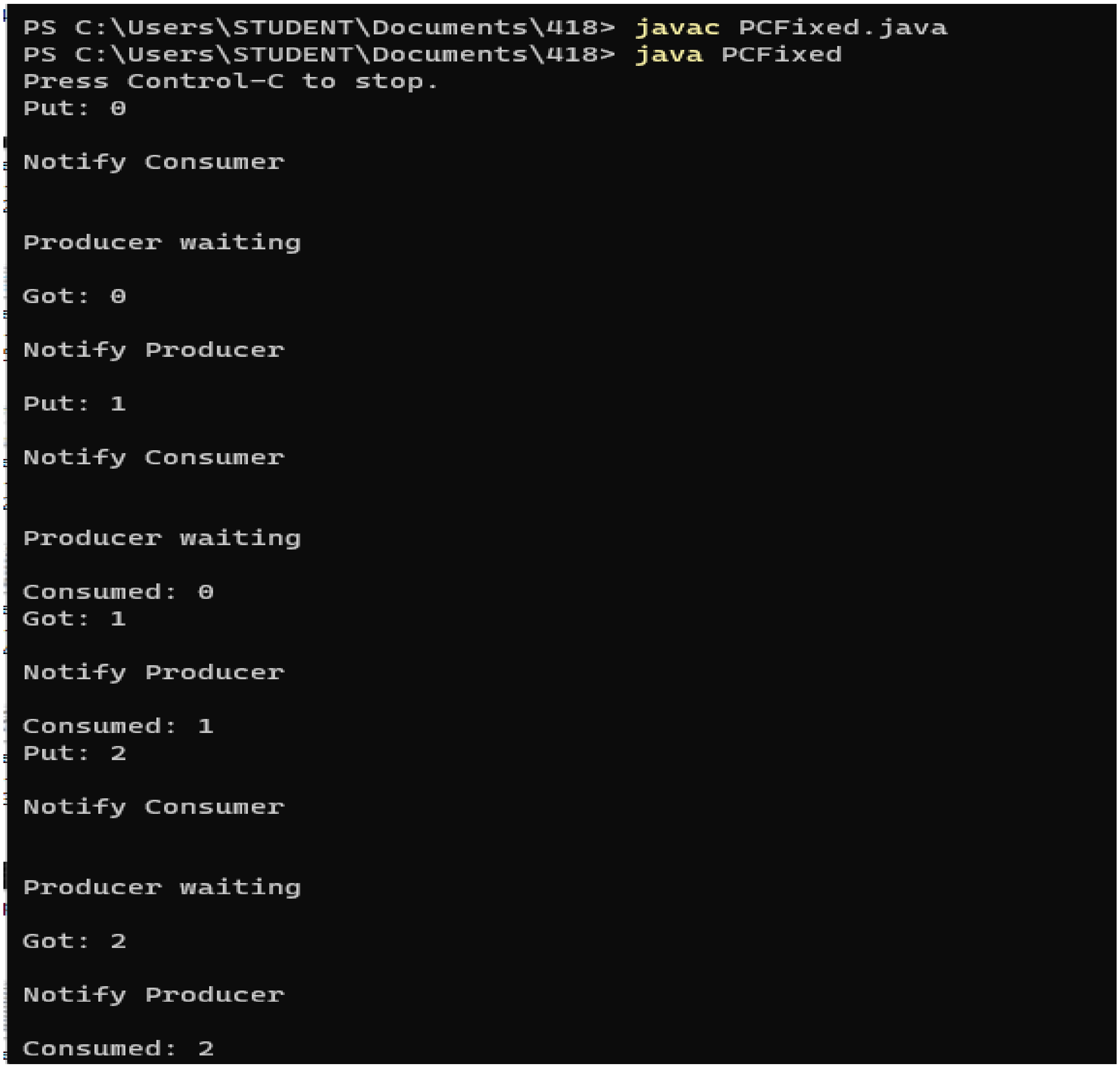
```
put: 1
Got: 1
put: 2
Got: 2
put: 3
Got: 3
put: 4
Got: 4
put: 5
Got: 5
```

10/10

CODE:

```
class Q {
    int n;
    boolean valueSet = false;

    synchronized int get() {
        while (!valueSet) {
            try {
                System.out.println("\nConsumer waiting\n");
                wait();
            } catch (InterruptedException e) {
                System.out.println("InterruptedException caught");
            }
        }
        System.out.println("Got: " + n);
        valueSet = false;
        System.out.println("\nNotify Producer\n");
        notify();
        return n;
    }

    synchronized void put(int n) {
        while (valueSet) {
            try {
                System.out.println("\nProducer waiting\n");
                wait();
            } catch (InterruptedException e) {
                System.out.println("InterruptedException caught");
            }
        }
         this.n = n;
        valueSet = true;
        System.out.println("Put: " + n);
        System.out.println("\nNotify Consumer\n");
        notify();
    }
}

class Producer implements Runnable {
    Q q;

    Producer(Q q) {
        this.q = q;
        new Thread(this, "Producer").start();
    }

    public void run() {
        int i = 0;
        while (i < 15) {
            q.put(i++);
        }
    }
}

class Consumer implements Runnable {
    Q q;

    Consumer(Q q) {
        this.q = q;
        new Thread(this, "Consumer").start();
    }

    public void run() {
        int i = 0;
        while (i < 15) {
            int r = q.get();
            System.out.println("Consumed: " + r);
            i++;
        }
    }
}

class PCFixed {
    public static void main(String args[]) {
        Q q = new Q();
        new Producer(q);
        new Consumer(q);
        System.out.println("Press Control-C to stop.");
    }
}
```

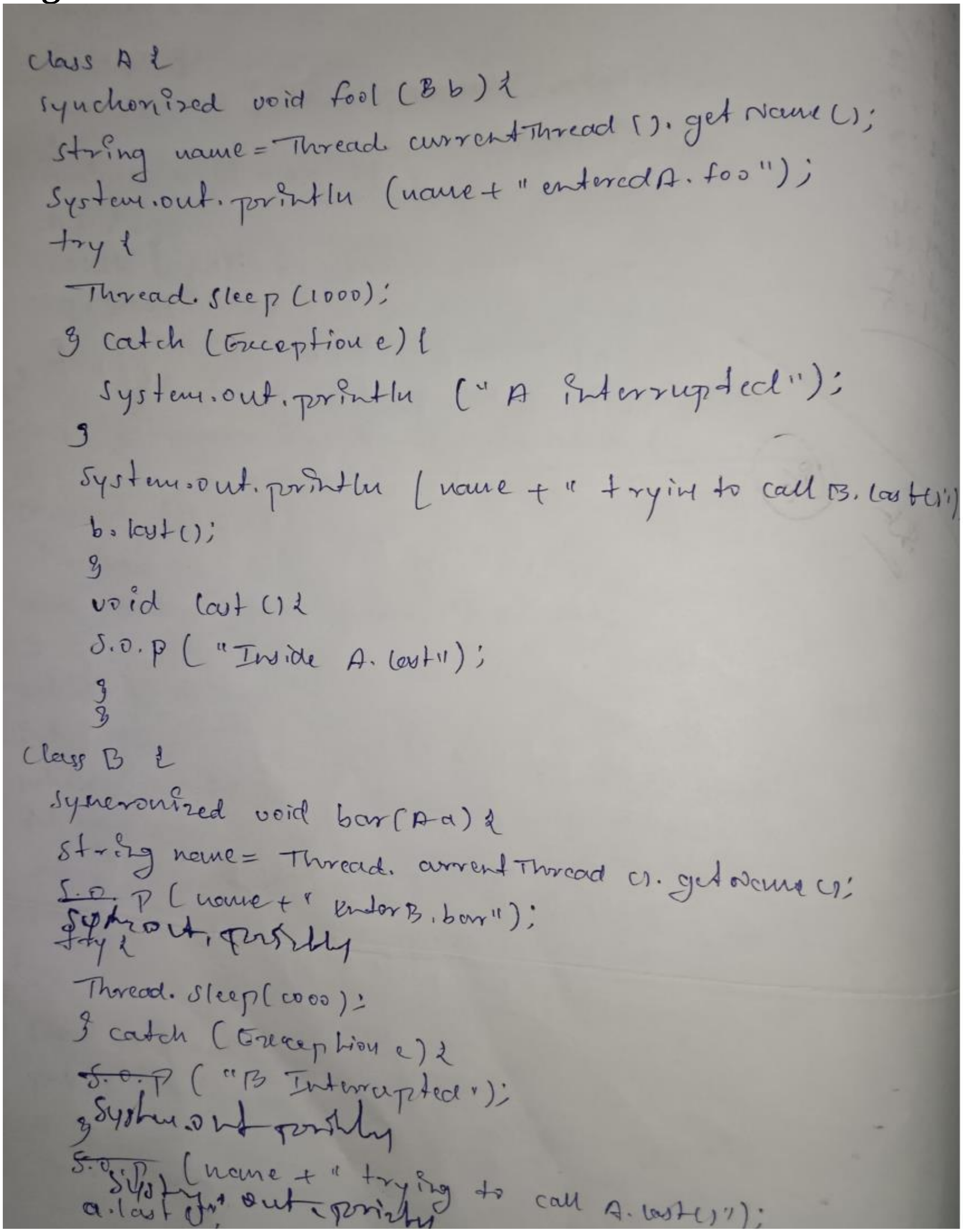
OUTPUT:



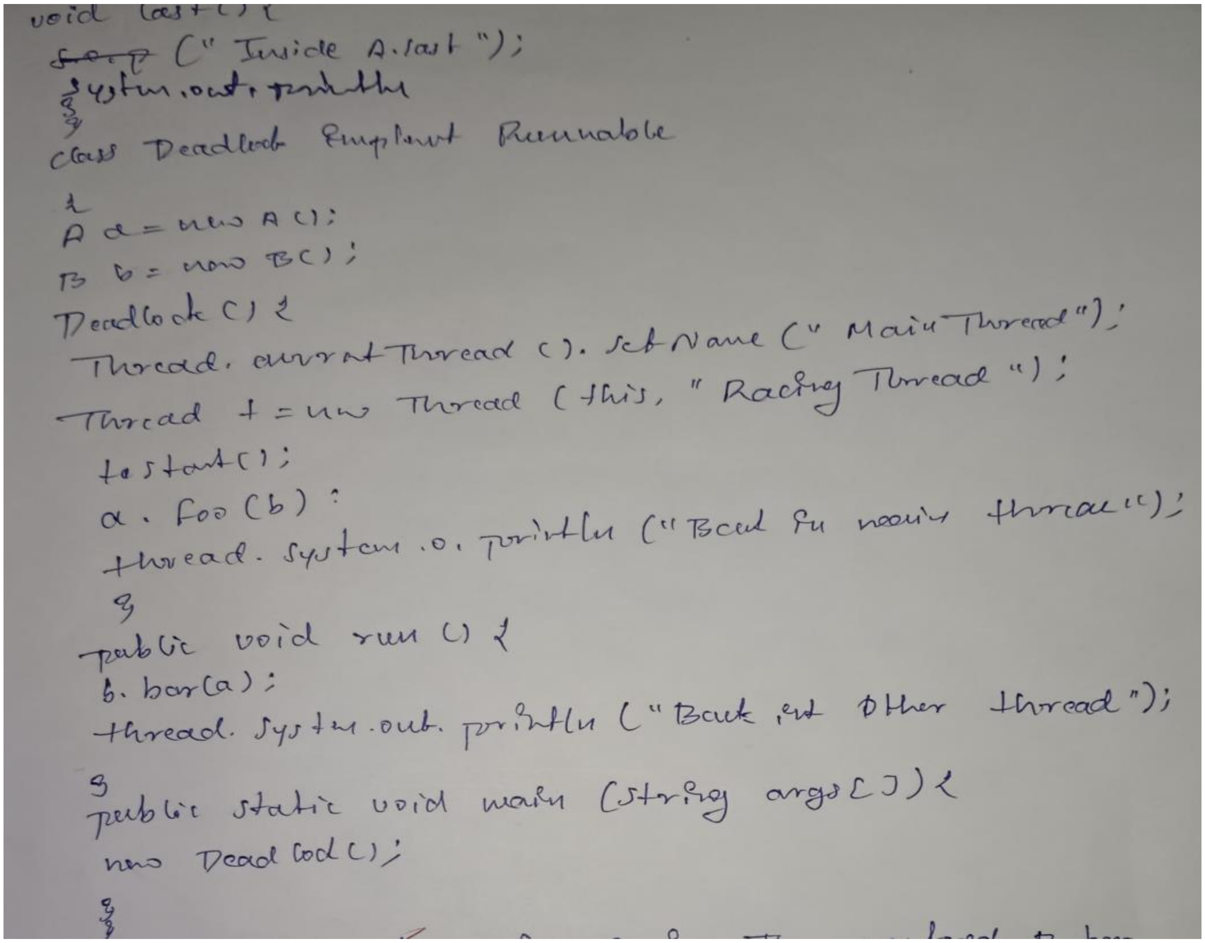
```
PS C:\Users\STUDENT\Documents\418> javac PCFixed.java
PS C:\Users\STUDENT\Documents\418> java PCFixed
Press Control-C to stop.
Put: 0

Notify Consumer


Producer waiting

Got: 0

Notify Producer

Put: 1

Notify Consumer


Producer waiting

Consumed: 0
Got: 1

Notify Producer

Consumed: 1
Put: 2

Notify Consumer


Producer waiting

Got: 2

Notify Producer

Consumed: 2
```

PROGRAM NO-10B:
Demonstrate Deadlock in Java

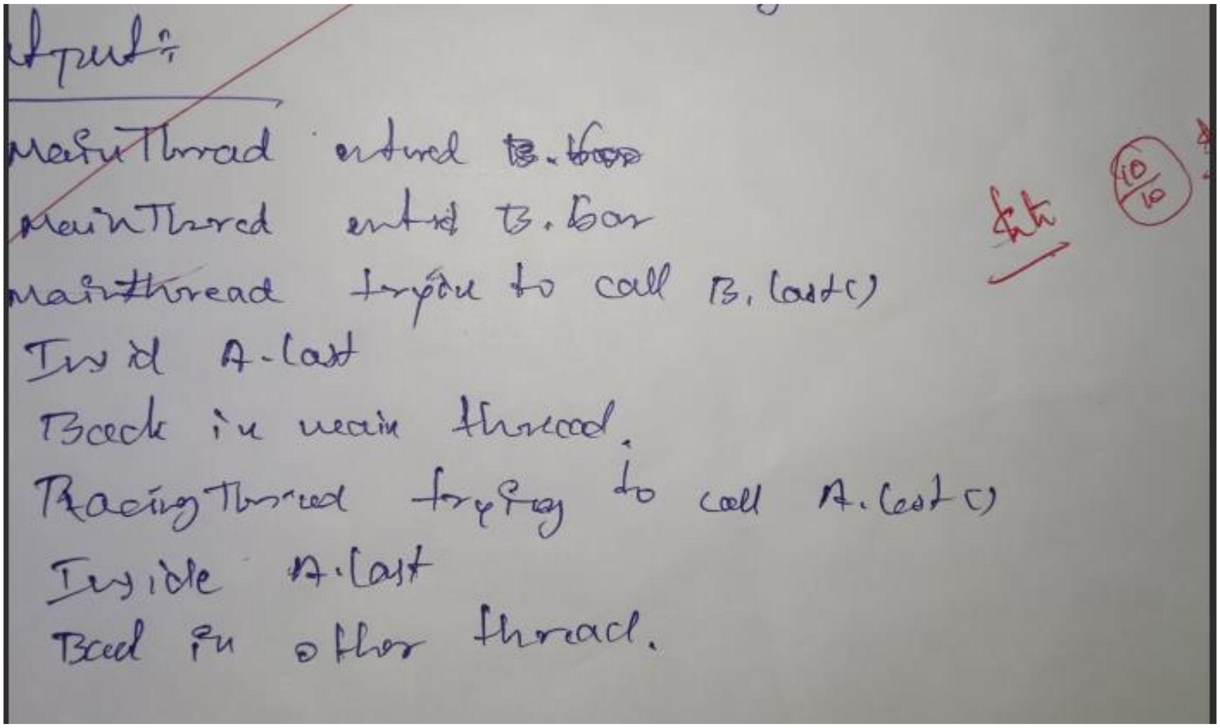
Algorithm:



```
class A {
 synchonized void fool (B b) {
  string name = Thread. currentThread (). get Name ();
  System.out.println (name + " enteredA. foo");
  try {
   Thread. sleep (1000);
   } catch (Exception e) {
     system.out.println (" A interrupted");
   }
   system.out.println [name + " tryin to call B. last()")
   b. last ();
   }
   void last () {
   S.O.P ( "Inside A. last");
   }
   }
class B {
  synchronized void bar(A a) {
  string name = Thread. currentThread (). getName ();
  S.O. P ( name + " EnterB. bar");
  System.out.println
  try {
   Thread. sleep(1000);
   } catch ( Exception e) {
   S.O.P ( "B Interrupted");
  } System.out.println
   S.O.P (name + " trying to call A. last()");
   System.out.println
  a. last ();
```



```
void last(){
~~sop~~ (" Inside A.last ");
}system.out.println
}
class Deadlock Emplement Runnable

{
A a = new A();
B b = new B();
Deadlock () {
 Thread. currentThread (). setName (" MainThread");
Thread t = new Thread ( this, " Racing Thread ");
  t.start();
  a. foo (b) :
  thread. system .o. println (" Back in main thread");
  }
 public void run () {
  b. bar(a);
 thread. System.out. println (" Back int other thread");
 }
 public static void main (String args[]){
  new Dead lock();
  }
  }
```



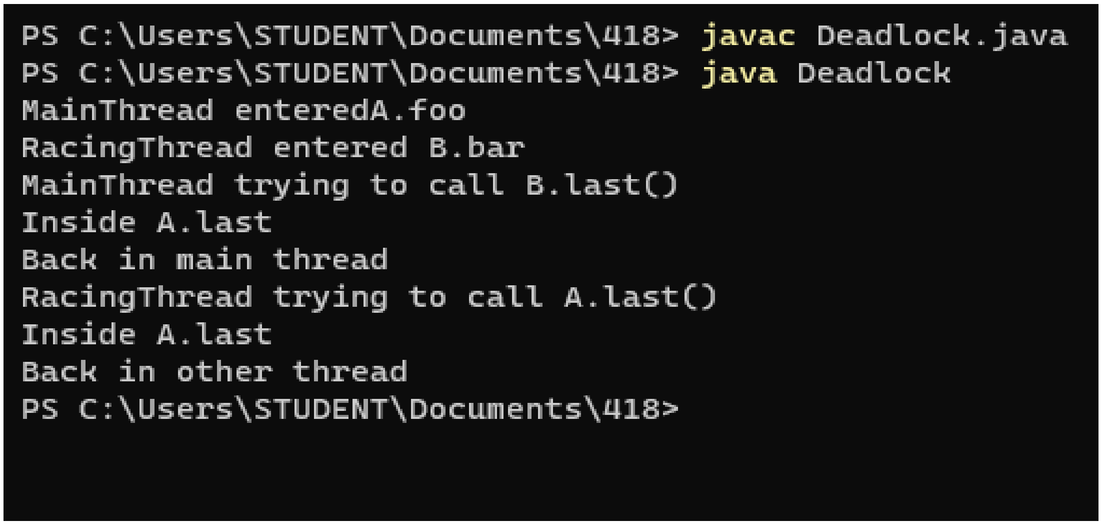
```
tput:
MainThread entered B.~~bar~~
MainThread entered B.bar
Mainthread trying to call B.last()
Inside A.last
 Back in main thread.
 RacingThread trying to call A.last()
 Inside A.last
 Back in other thread.
```

10/10

CODE:

```
class A {
synchronized void foo(B b) {
String name =Thread.currentThread().getName();
System.out.println(name + " enteredA.foo");
try {
Thread.sleep(1000);
} catch(Exception e) {
System.out.println("A Interrupted");
}

System.out.println(name + " trying to call B.last()");
b.last();
}
void last() {
System.out.println("Inside A.last");
}
}
class B {
synchronized void bar(A a) {
String name =Thread.currentThread().getName();
System.out.println(name + " entered B.bar");
try {
Thread.sleep(1000);
} catch(Exception e) {
System.out.println("B Interrupted");
}
System.out.println(name + " trying to call A.last()");

a.last();
}

void last() {
System.out.println("Inside A.last");
}
}

class Deadlock implements Runnable
{
A a = new A();
B b = new B();
Deadlock() {
Thread.currentThread().setName("MainThread");
Thread t = new Thread(this,"RacingThread");
t.start();
a.foo(b); // get lock on a in this thread.
System.out.println("Back in main thread");
}

public void run() {
b.bar(a); // get lock on b in other thread.
System.out.println("Back in other thread");
}

public static void main(String args[]) {
new Deadlock();
}
}
```

OUTPUT:



```
PS C:\Users\STUDENT\Documents\418> javac Deadlock.java
PS C:\Users\STUDENT\Documents\418> java Deadlock
MainThread enteredA.foo
RacingThread entered B.bar
MainThread trying to call B.last()
Inside A.last
Back in main thread
RacingThread trying to call A.last()
Inside A.last
Back in other thread
PS C:\Users\STUDENT\Documents\418>
```