VISVESVARAYA TECHNOLOGICAL UNIVERSITY

"JnanaSangama", Belgaum -590014, Karnataka.

LAB REPORT on

Object Oriented Java Programming

(23CS3PCOOJ)

Submitted by

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in partial fulfillment for the award of the degree of

BACHELOR OF ENGINEERING

in

COMPUTER SCIENCE AND ENGINEERING

B.M.S. COLLEGE OF ENGINEERING

(Autonomous Institution under VTU)

BENGALURU-560019

Sep-2024 to Jan-2025

B.M.S. College of Engineering,

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(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 **Anu Sai Shree R (1BM23CS045),** 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.

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Github Link:

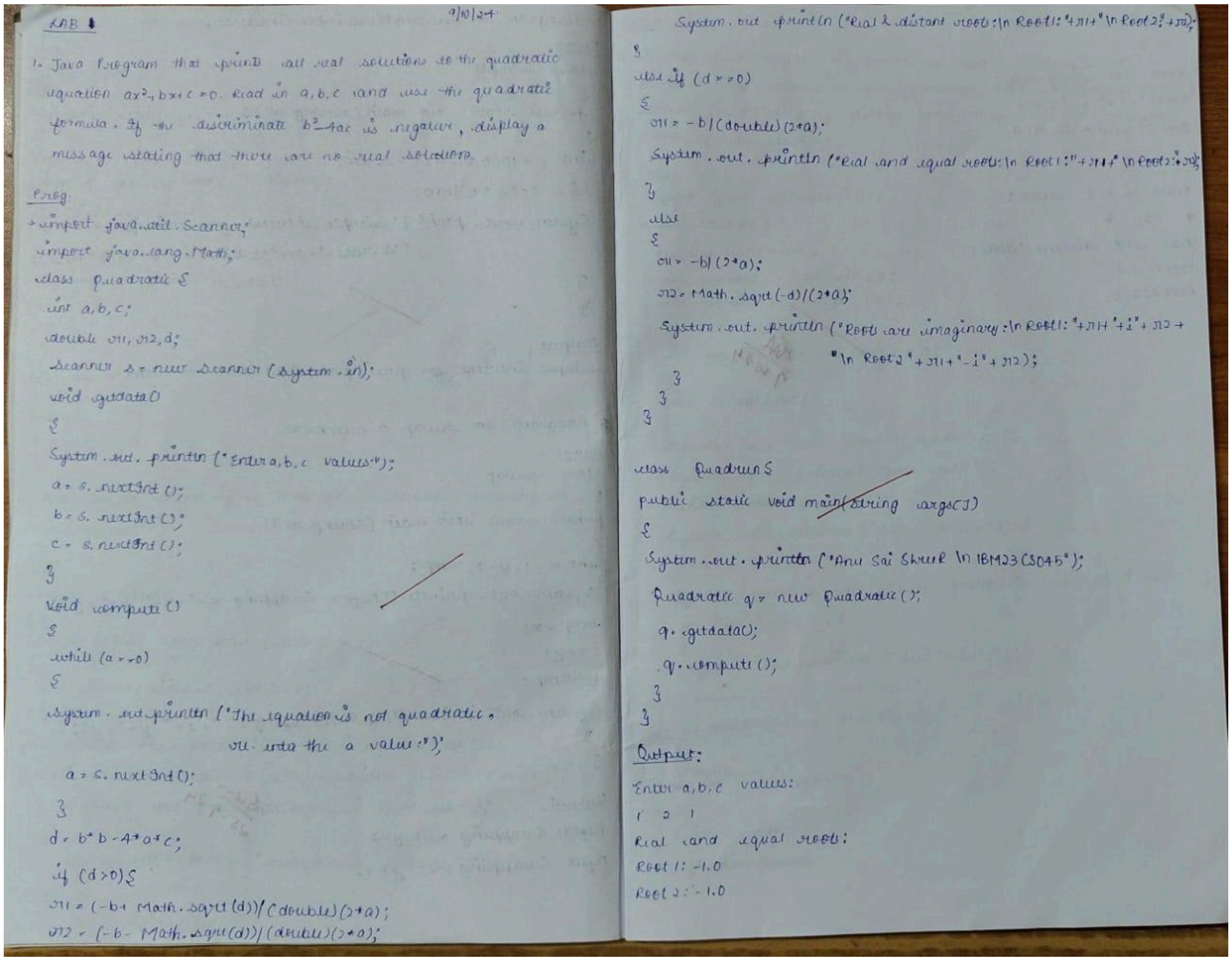
https://github.com/Anu1BM23CS045/Java-Lab-OOJ

Program 1

Implement Quadratic Equation

Program that prints all real solutions to the quadratic equation ax2+bx+c = 0. Read in a, b, c and use the quadratic formula. If the discriminate b2-4ac is negative, display a message stating that there are no real solutions.

Algorithm:



LAB 1

9/10/24

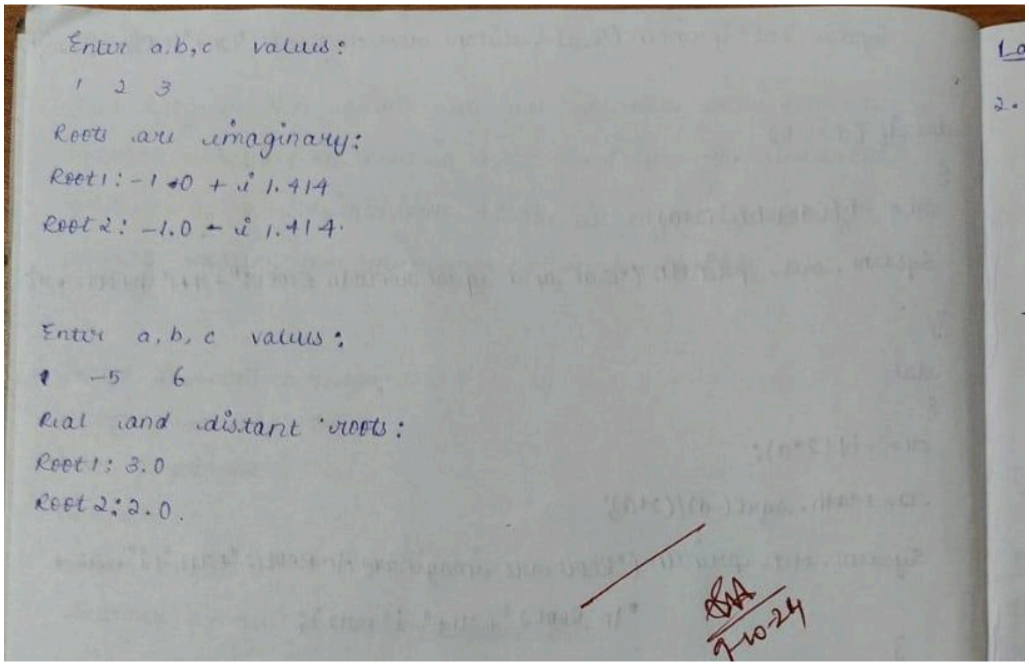
1. Java Program that prints all real solutions to the quadratic equation $ax^2+bx+c=0$. Read in a, b, c and use the quadratic formula. If the discriminate b^2-4ac is negative, display a message stating that there are no real solutions.

Prog:

```
import java.util.Scanner;
import java.lang.Math;
class Quadratic {
 int a,b,c;
 double r1, r2, d;
 Scanner s = new Scanner (System.in);
 void getdata()
 {
 System.out.println ("Enter a,b,c values:");
  a = s.nextInt ();
  b = s.nextInt ();
  c = s.nextInt ();
 }
 void compute ()
 {
 while (a==0)
 {
 System.out.println ("The equation is not quadratic.
                     re-enter the a value:");
   a = s.nextInt();
  }
 d = b*b-4*a*c;
 if (d>0){
 r1 = (-b+ Math.sqrt (d))/(double)(2*a);
 r2 = (-b- Math.sqrt(d))/(double)(2*a);
      System.out.println ("Real & distant roots:\n Root1:"+r1+"\n Root2:"+r2);
}
else if (d==0)
 {
  r1 = -b/(double)(2*a);
  System.out.println ("Real and equal roots:\n Root1:"+r1+"\n Root2:"+r1);
 }
 else
 {
  r1 = -b/(2*a);
  r2 = Math.sqrt(-d)/(2*a);
  System.out.println ("Roots are imaginary:\n Root1:"+r1+"+i"+r2+
                   "\n Root2"+r1+"-i"+r2);
    }
   }
 }

class QuadrunS
public static void main(String args[])
{
 System.out.println ("Anu Sai Shree \n 1BM23CS045");
  Quadratic q = new Quadratic ();
  q.getdata();
  q.compute ();
 }
}
```

Output:

```
Enter a,b,c values:
1 2 1
Real and equal roots:
Root 1: -1.0
Root 2: -1.0
```



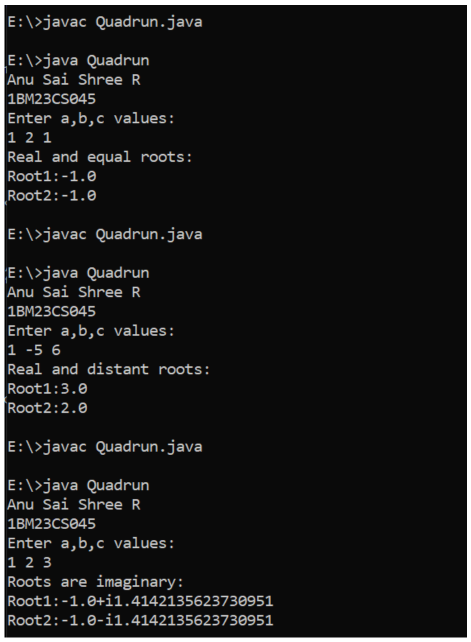
```
Enter a,b,c values:
1 2 3
Roots are imaginary:
Root1: -1.0 + i 1.414
Root2: -1.0 - i 1.414.

Enter a,b,c values:
1 -5 6
Real and distant roots:
Root1: 3.0
Root2: 2.0.
```

[illegible]
9-10-24

<u>Code:</u>

```
import java.util.Scanner;
import java.lang.Math;
class Quadratic {
    int a, b, c;
    double r1, r2, d;
    Scanner s = new Scanner(System.in);
    void getdata() {
        System.out.println("Enter a,b,c values:");
        a = s.nextInt();
        b = s.nextInt();
        c = s.nextInt();
    }
    void compute() {
        while (a == 0) {
            System.out.println("The equation is not quadratic,re-enter the a value:");
            a = s.nextInt();
        }
        d = b * b - 4 * a * c;
        if (d > 0) {
            r1 = (-b + Math.sqrt(d)) / (double)(2 * a);
            r2 = (-b - Math.sqrt(d)) / (double)(2 * a);
            System.out.println("Real and distant roots:\nRoot1:" + r1 + "\nRoot2:" +r2);
        } else if (d == 0) {
            r1 = -b / (double)(2 * a);
            System.out.println("Real and equal roots:\nRoot1:" + r1 + "\nRoot2:" + r1);
        } else {
            r1 = -b / (2 * a);
            r2 = Math.sqrt(-d) / (2 * a);
            System.out.println("Roots are imaginary:\nRoot1:" + r1 + "+i" + r2 +
"\nRoot2:" + r1 + "-i" + r2);
        }
    }
}

class Quadrun {
    public static void main(String args[]) {
        Quadratic q = new Quadratic();
        q.getdata();
        q.compute();
    }
}
```

Output:



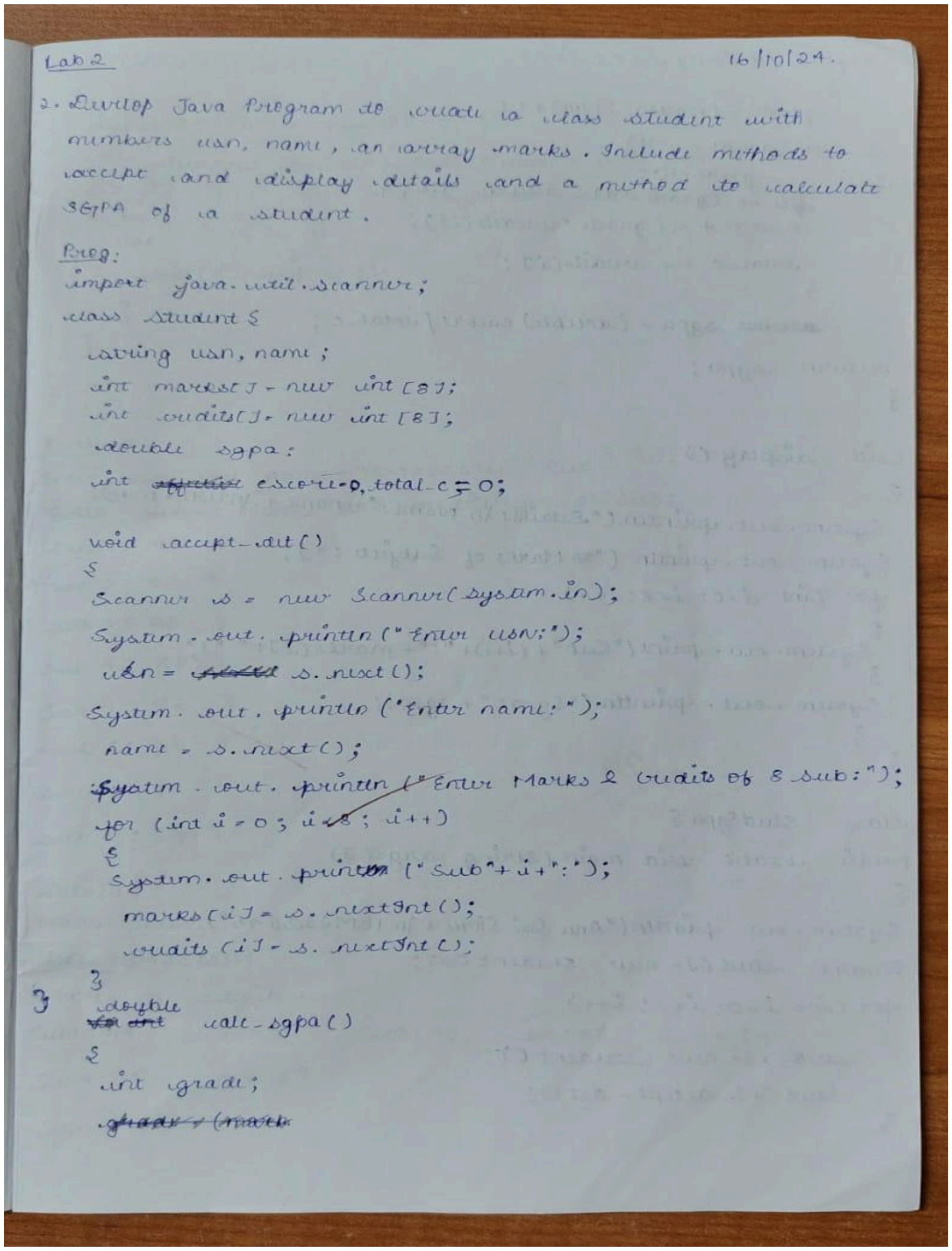
```
E:\>javac Quadrun.java

E:\>java Quadrun
Anu Sai Shree R
1BM23CS045
Enter a,b,c values:
1 2 1
Real and equal roots:
Root1:-1.0
Root2:-1.0

E:\>javac Quadrun.java

E:\>java Quadrun
Anu Sai Shree R
1BM23CS045
Enter a,b,c values:
1 -5 6
Real and distant roots:
Root1:3.0
Root2:2.0

E:\>javac Quadrun.java

E:\>java Quadrun
Anu Sai Shree R
1BM23CS045
Enter a,b,c values:
1 2 3
Roots are imaginary:
Root1:-1.0+i1.4142135623730951
Root2:-1.0-i1.4142135623730951
```

Program 2

Calculation Of Student SGPA

Program to create a class Student with members usn, name, an array credits and an array marks. Include methods to accept and display details and a method to calculate SGPA of a student.

Algorithm:

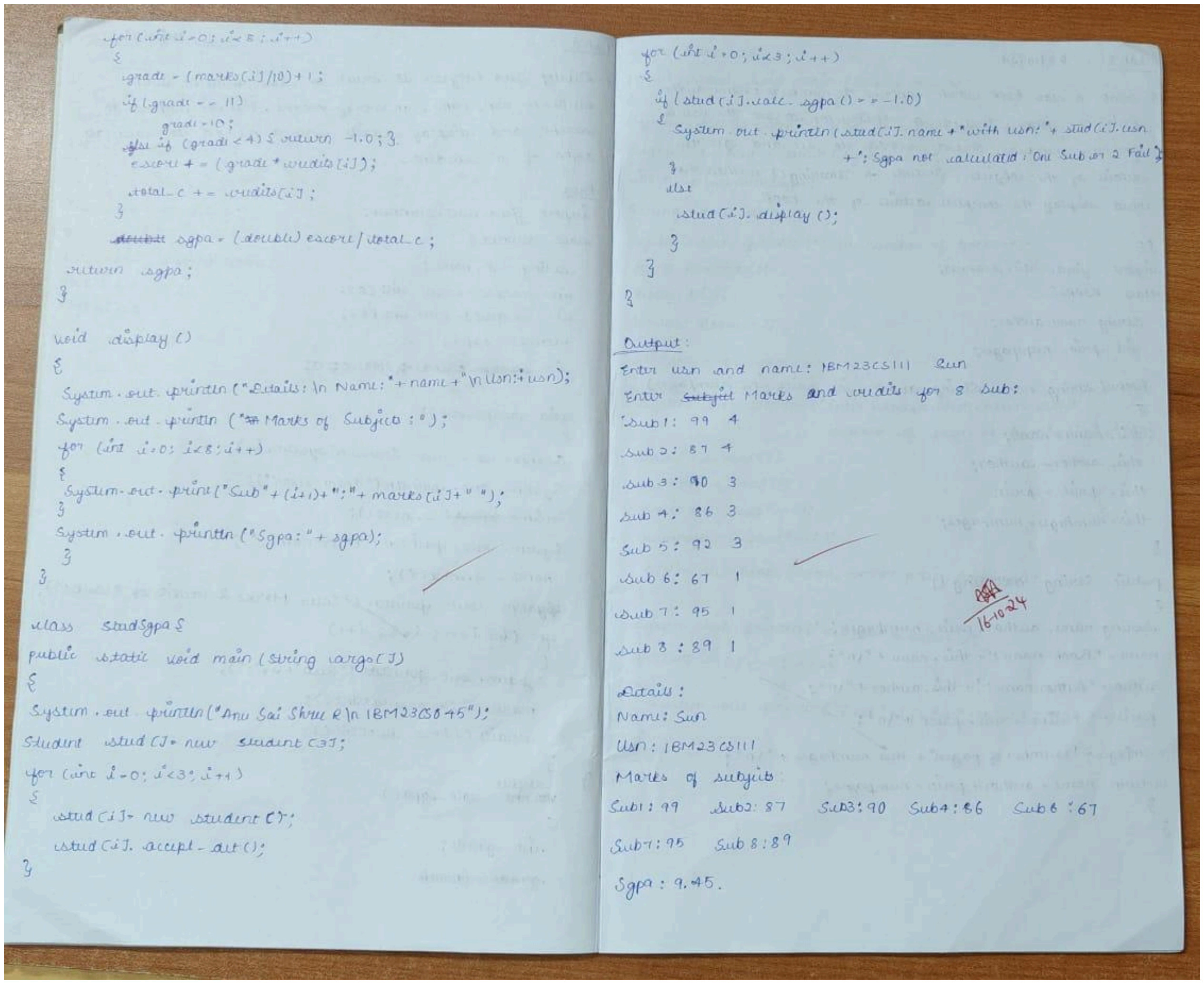


Lab 2 16/10/24.

2. Develop Java Program to create a class Student with members usn, name, an array marks. Include methods to accept and display details and a method to calculate SGPA of a student.

Prog:

```
import java.util.Scanner;
class Student {
  String usn, name;
  int marks[] = new int [8];
  int credits[] = new int [8];
  double sgpa;
  int ~~effective~~ escore=0, total_c=0;

  void accept_det()
  {
  Scanner s = new Scanner(System.in);
  System.out.println("Enter usn:");
   usn = ~~[illegible]~~ s.next();
  System.out.println("Enter name:");
   name = s.next();
  System.out.println("Enter Marks & credits of 8 sub:");
  for (int i = 0; i<8; i++)
   {
   System.out.println("Sub"+i+":");
    marks[i] = s.nextInt();
    credits[i] = s.nextInt();
   }
}
  ~~int~~ double calc_sgpa()
  {
   int grade;
   ~~grade = (mark~~
```



```
for (int i=0; i<8; i++)
{
 grade = (marks[i]/10)+1;
 if (grade == 11)
     grade = 10;
 ~~else~~ if (grade < 4) { return -1.0; }
 escore += (grade * credits[i]);
 total_c += credits[i];
}
~~double~~ sgpa = (double) escore / total_c;
return sgpa;
}

void display ()
{
System.out.println ("Details: \n Name:"+ name +"\n Usn:"+ usn);
System.out.println ("Marks of Subjects :");
for (int i=0; i<8; i++)
{
System.out.print ("Sub" + (i+1)+":"+ marks[i]+" ");
}
System.out.println ("Sgpa:"+ sgpa);
}
}

class studSgpa {
public static void main (String args[])
{
System.out.println("Anu Sai Shree R \n 1BM23CS045");
Student stud[]= new Student[3];
for (int i=0; i<3; i++)
{
  stud[i]= new Student();
  stud[i].accept_det();
}
for (int i=0; i<3; i++)
{
 if (stud[i].calc_sgpa() == -1.0)
 {
  System.out.println(stud[i].name +"with usn:"+ stud[i].usn
                       +": Sgpa not calculated : One Sub or 2 Fail");
 }
 else
  stud[i].display();
 }
}
}
```

Output:

```
Enter usn and name: 1BM23CS111  Sun
Enter ~~Subject~~ Marks and credits for 8 sub:
Sub1: 99  4
Sub2: 87  4
Sub3: 90  3
Sub4: 86  3
Sub5: 92  3
Sub6: 67  1
Sub7: 95  1
Sub8: 89  1

Details:
Name: Sun
Usn: 1BM23CS111
Marks of subjects
Sub1: 99   Sub2: 87   Sub3: 90   Sub4: 86   Sub6: 67
Sub7: 95   Sub8: 89
Sgpa: 9.45.
```

[illegible]
16-10-24

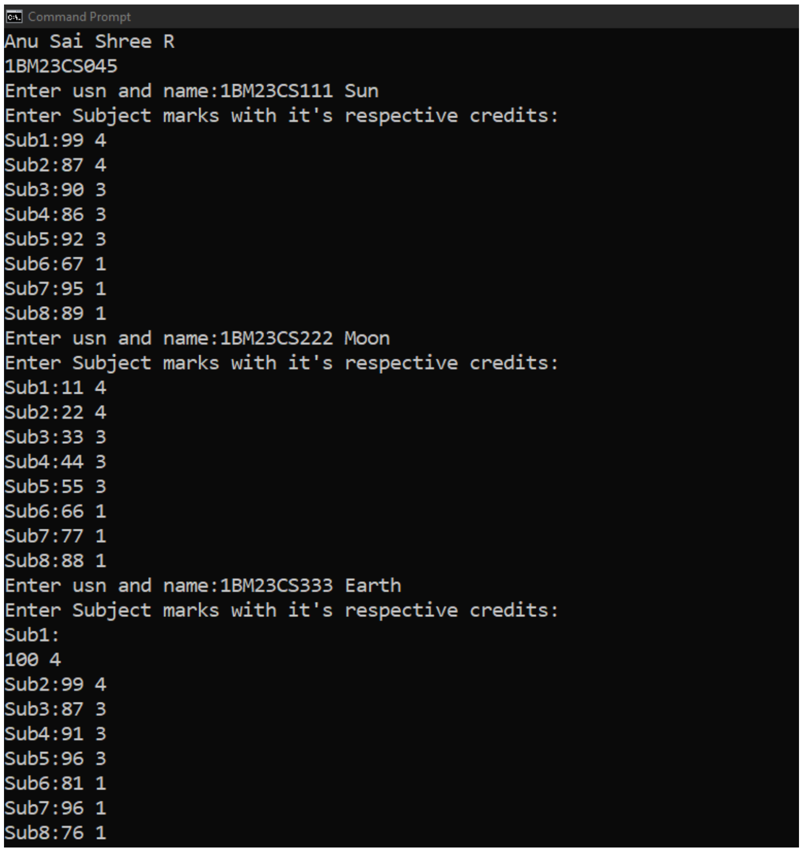
Code:

```
import java.util.Scanner;
class Student {
   int marks[] = new int[8];
   int credits[] = new int[8];
   String usn, name;
   double sgpa;
   int escore = 0, total_c = 0;



   void accept_det() {
      Scanner s = new Scanner(System.in);
```

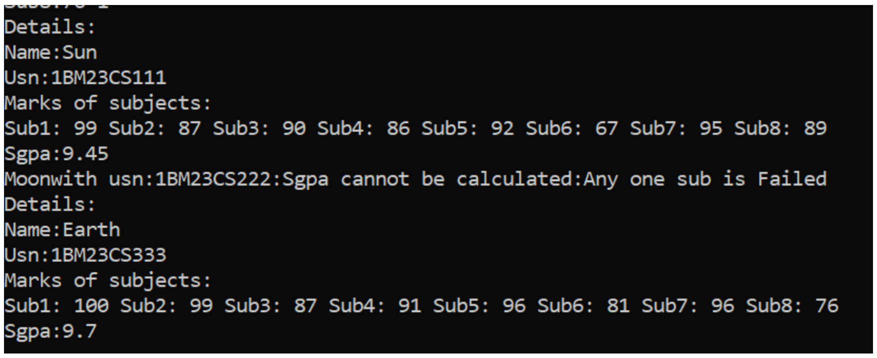
```
        System.out.print("Enter usn and name:");
        usn = s.next();
        name = s.next();
        System.out.println("Enter Subject marks with it's respective credits:");
        for (int i = 0; i < 8; i++) {
            System.out.print("Sub" + (i + 1) + ":");
            marks[i] = s.nextInt();
            credits[i] = s.nextInt();
        }
    }

    double calc_sgpa() {
        int grade;
        for (int i = 0; i < 8; i++) {
            grade = (marks[i] / 10) + 1;
            if (grade == 11)
                grade = 10;
            else if (grade < 4)
                return -1.0;
            escore += (grade * credits[i]);
            total_c += credits[i];
        }
        sgpa = (double) escore / total_c;
        return sgpa;
    }

    void display() {
        System.out.println("Details:\nName:" + name + "\nUsn:" + usn + "\nMarks of
subjects:");
        for (int i = 0; i < 8; i++) {
            System.out.print("Sub" + (i + 1) + ": " + marks[i] + " ");
        }

        System.out.println("\nSgpa:" + sgpa);
    }
}
```

```
class StudSgpa {
   public static void main(String args[]) {
      System.out.println("Anu Sai Shree R\n1BM23CS045");
      Student stud[] = new Student[3];
      for (int i = 0; i < 3; i++) {
         stud[i] = new Student();
         stud[i].accept_det();
      }
      for (int i = 0; i < 3; i++) {

         if (stud[i].calc_sgpa() == -1.0)
            System.out.println(stud[i].name + "with usn:" + stud[i].usn + ":Sgpa
cannot be calculated:Any one sub is Failed");
         else
            stud[i].display();
      }
   }
}
```

Output:



```
Command Prompt
Anu Sai Shree R
1BM23CS045
Enter usn and name:1BM23CS111 Sun
Enter Subject marks with it's respective credits:
Sub1:99 4
Sub2:87 4
Sub3:90 3
Sub4:86 3
Sub5:92 3
Sub6:67 1
Sub7:95 1
Sub8:89 1
Enter usn and name:1BM23CS222 Moon
Enter Subject marks with it's respective credits:
Sub1:11 4
Sub2:22 4
Sub3:33 3
Sub4:44 3
Sub5:55 3
Sub6:66 1
Sub7:77 1
Sub8:88 1
Enter usn and name:1BM23CS333 Earth
Enter Subject marks with it's respective credits:
Sub1:
100 4
Sub2:99 4
Sub3:87 3
Sub4:91 3
Sub5:96 3
Sub6:81 1
Sub7:96 1
Sub8:76 1
```



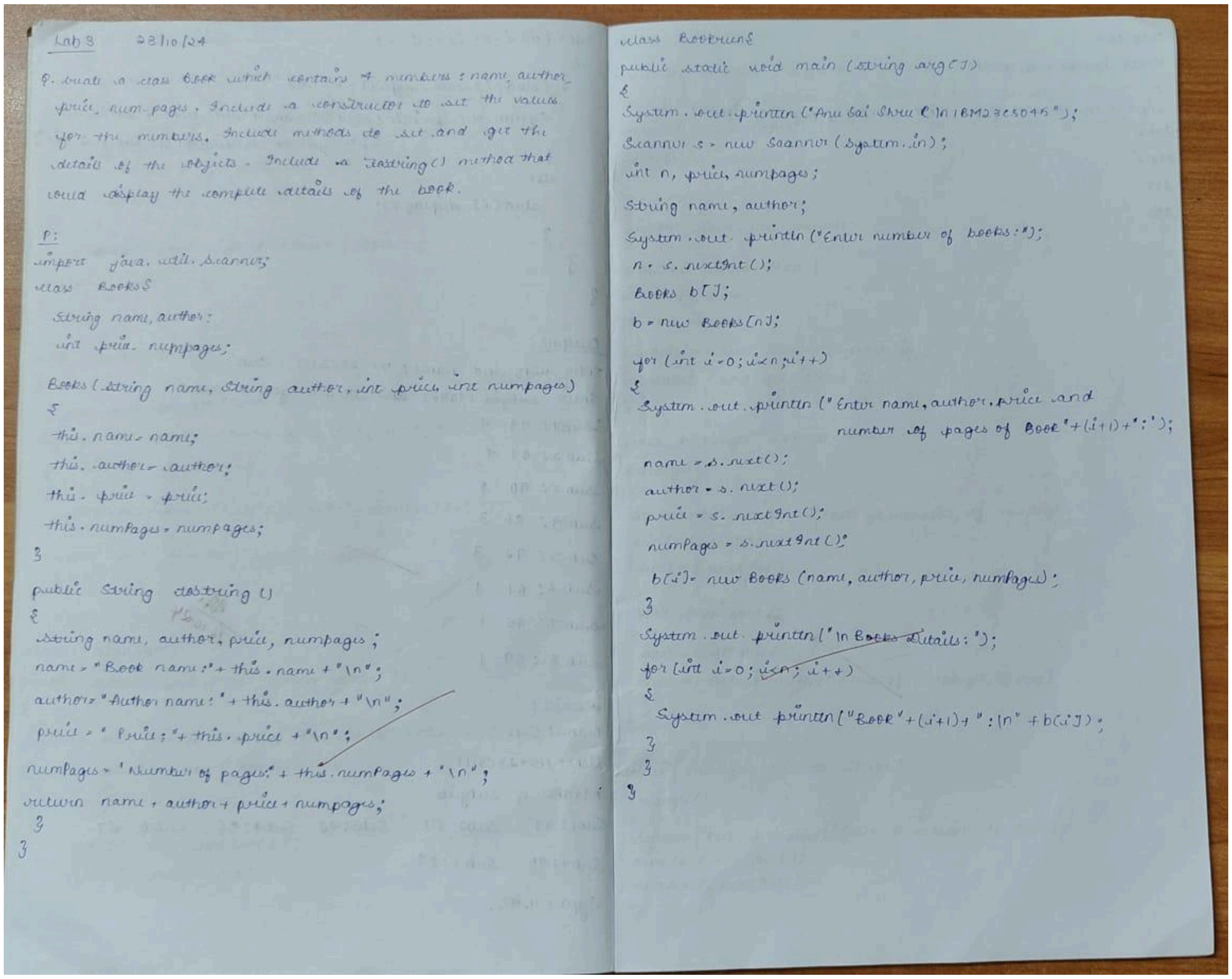
```
Details:
Name:Sun
Usn:1BM23CS111
Marks of subjects:
Sub1: 99 Sub2: 87 Sub3: 90 Sub4: 86 Sub5: 92 Sub6: 67 Sub7: 95 Sub8: 89
Sgpa:9.45
Moonwith usn:1BM23CS222:Sgpa cannot be calculated:Any one sub is Failed
Details:
Name:Earth
Usn:1BM23CS333
Marks of subjects:
Sub1: 100 Sub2: 99 Sub3: 87 Sub4: 91 Sub5: 96 Sub6: 81 Sub7: 96 Sub8: 76
Sgpa:9.7
```

Program 3

Demonstration of Array of objects of each book type

Create a class Book which contains four members: name, author, price, num_pages. Include a constructor to set the values for the members. Include methods to set and get the details of the objects. Include a toString( ) method that could display the complete details of the book. Develop a Java program to create n book objects.

<u>Algorithm:</u>



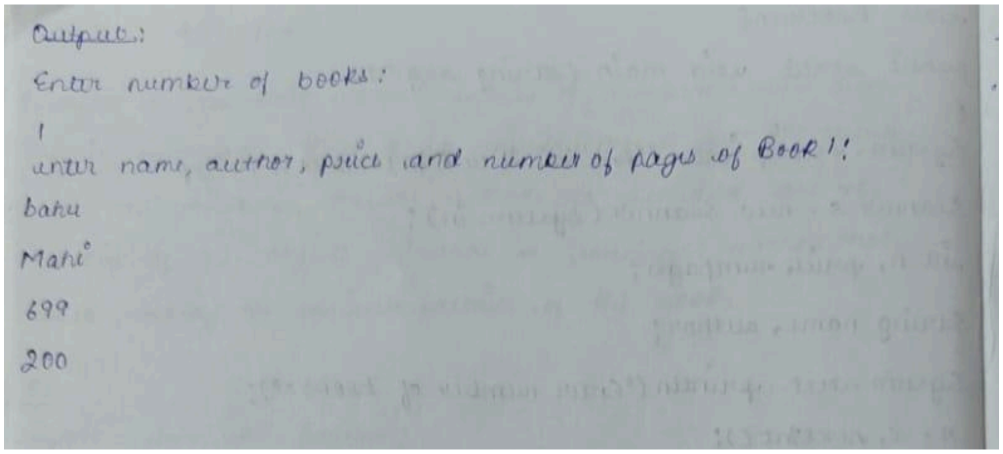
Lab 3 28/10/24

Q. Create a class Book which contains 4 members : name, author, price, num-pages. Include a constructor to set the values for the members. Include methods to set and get the details of the objects. Include a toString() method that would display the complete details of the book.

P:

```
import java.util.Scanner;
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 BookRun{
public static void main (String arg[])
{
System.out.println("Anu Sai Shree C \n 1BM23CS045");
Scanner s = new Scanner(System.in);
int n, price, numpages;
String name, author;
System.out.println("Enter number of books:");
 n = s.nextInt();
 Books b[];
 b = new Books[n];

 for (int i=0; i<n; i++)
 {
  System.out.println("Enter name, author, price and
                        number of pages of Book"+(i+1)+":");

  name = s.next();
  author = s.next();
  price = s.nextInt();
  numPages = s.nextInt();
  b[i] = new Books(name, author, price, numPages);
 }
 System.out.println("\n Books Details:");
 for (int i=0; i<n; i++)
 {
  System.out.println("Book"+(i+1)+":\n" + b[i]);
 }
 }
}
```



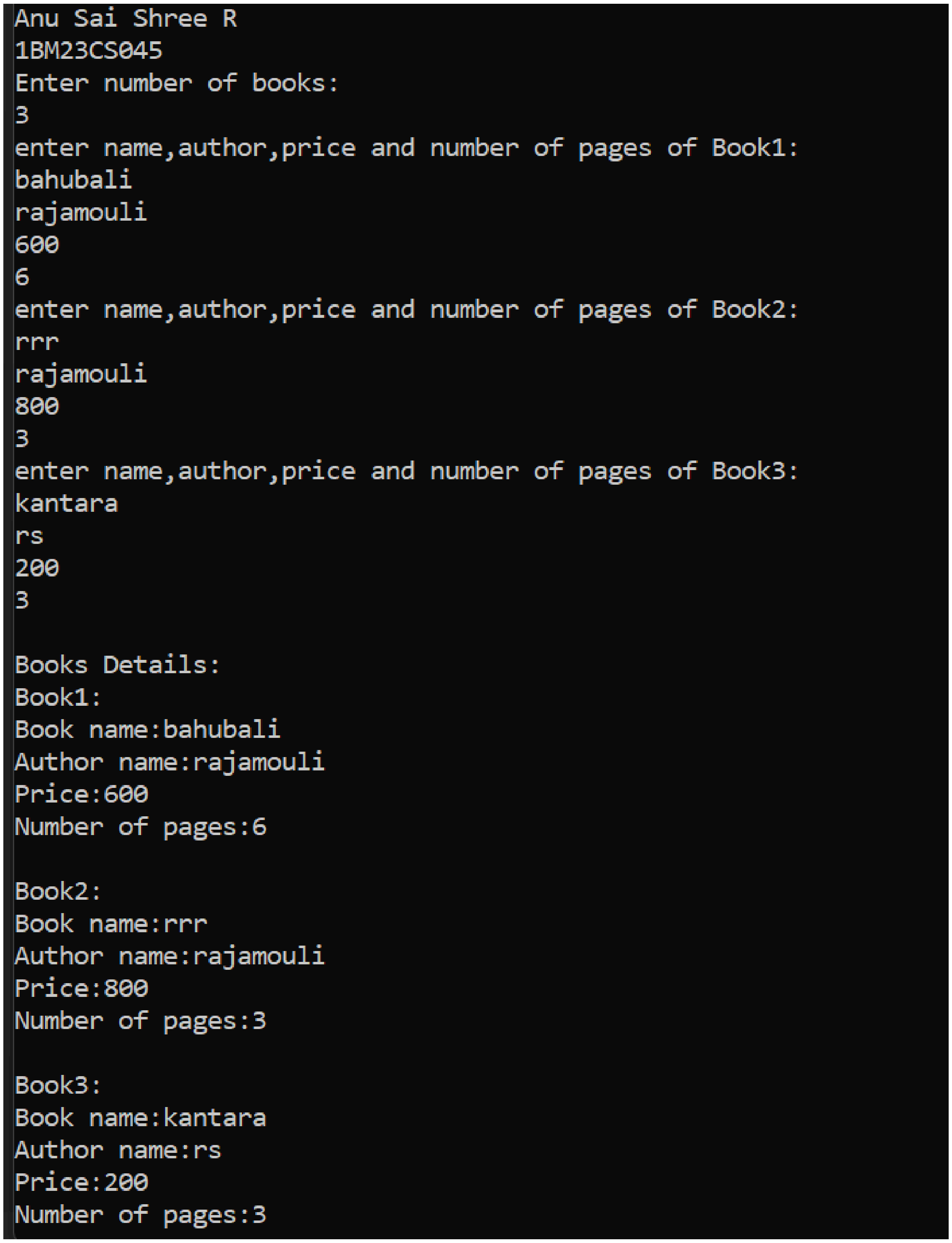
Output:

```
Enter number of books:
1
enter name, author, price and number of pages of Book 1:
bahu
Mahi
699
200
```

Code:

```
import java.util.Scanner;
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 Bookrun {
    public static void main(String arg[]) {
        System.out.println("Anu Sai Shree R\n1BM23CS045");
        Scanner s = new Scanner(System.in);
        int n, price, numPages;
        String name, author;
        System.out.println("Enter number of books:");
        n = s.nextInt();
        Books b[];
        b = new Books[n];

        for (int i = 0; i < n; i++) {
            System.out.println("enter name,author,price and number of pages of Book"
+ (i + 1) + ":");
            name = s.next();
            author = s.next();
            price = s.nextInt();
            numPages = s.nextInt();
            b[i] = new Books(name, author, price, numPages);
        }
        System.out.println("\nBooks Details:");
        for (int i = 0; i < n; i++) {
            System.out.println("Book" + (i + 1) + ":\n" + b[i]);
        }
    }
}
```

Output:



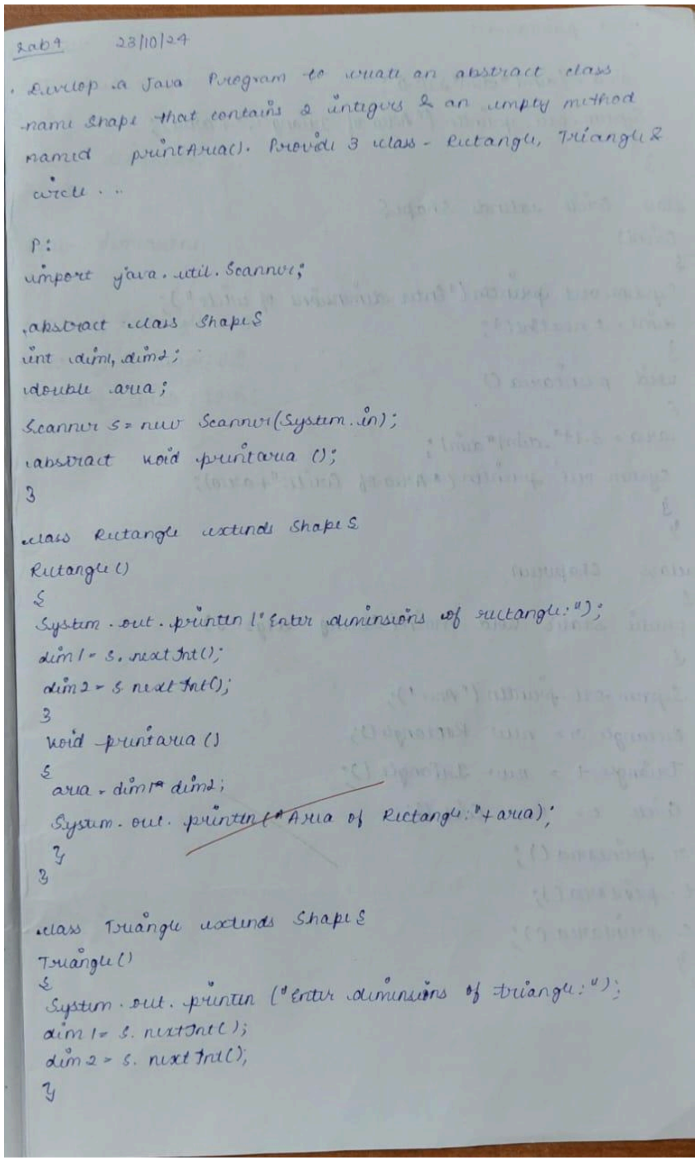
```
Anu Sai Shree R
1BM23CS045
Enter number of books:
3
enter name,author,price and number of pages of Book1:
bahubali
rajamouli
600
6
enter name,author,price and number of pages of Book2:
rrr
rajamouli
800
3
enter name,author,price and number of pages of Book3:
kantara
rs
200
3

Books Details:
Book1:
Book name:bahubali
Author name:rajamouli
Price:600
Number of pages:6

Book2:
Book name:rrr
Author name:rajamouli
Price:800
Number of pages:3

Book3:
Book name:kantara
Author name:rs
Price:200
Number of pages:3
```

Program 4

Demonstration Of Abstract Class

program to create an abstract class named Shape that contains two integers and an empty method named printArea( ). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contain only the method printArea( ) that prints the area of the given shape

Algorithm:

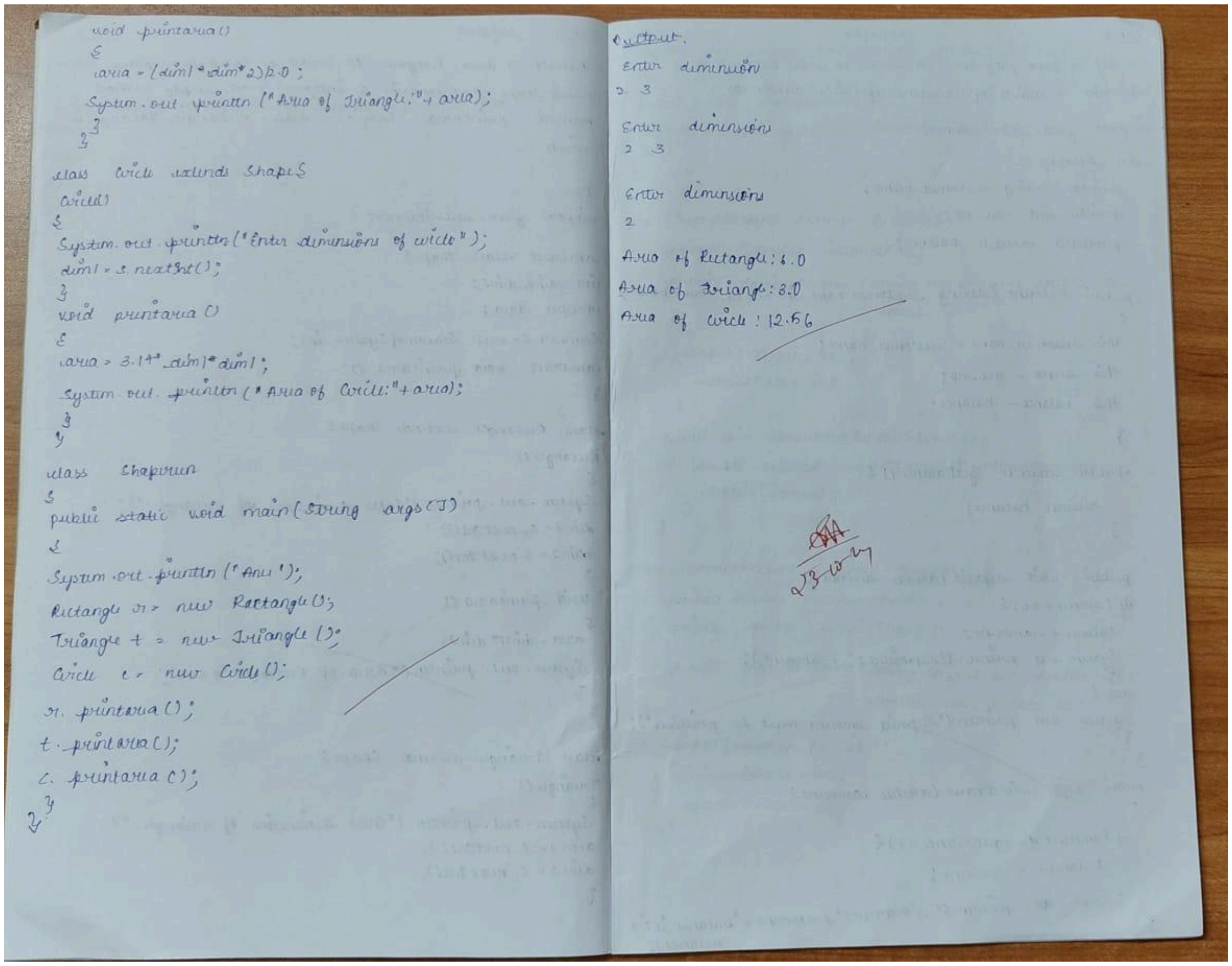


Lab4 23/10/24

- Develop a Java Program to create an abstract class name Shape that contains 2 integers & an empty method named printArea(). Provide 3 class - Rectangle, Triangle & circle . ..

P:

```
import java.util.Scanner;

abstract class Shape{
int dim1, dim2;
double area;
Scanner s = new Scanner(System.in);
abstract void printarea ();
}

class Rectangle extends Shape{
Rectangle()
{
 System.out.println("Enter dimensions of rectangle:");
 dim1 = s.nextInt();
 dim2 = s nextInt();
}
 void printarea()
{
  area = dim1* dim2;
  System.out.println("Area of Rectangle:"+area);
  }
}

class Triangle extends Shape{
Triangle()
{
 System.out.println ("Enter dimensions of triangle:");
 dim1 = s.nextInt();
 dim2 = s. nextInt();
}
```



```
void printarea()
{
area = (dim1*dim2)/2.0;
System.out.println("Area of Triangle:"+ area);
}
}
class Circle extends Shape{
Circle()
{
System.out.println("Enter dimensions of circle");
dim1 = s.nextInt();
}
void printarea()
{
area = 3.14*dim1*dim1;
System.out.println("Area of Circle:"+area);
}
}
class Shaperun
{
public static void main(String args[])
{
System.out.println("Anu");
Rectangle r = new Rectangle();
Triangle t = new Triangle();
Circle c = new Circle();
r.printarea();
t.printarea();
c.printarea();
}
}
```

Output.

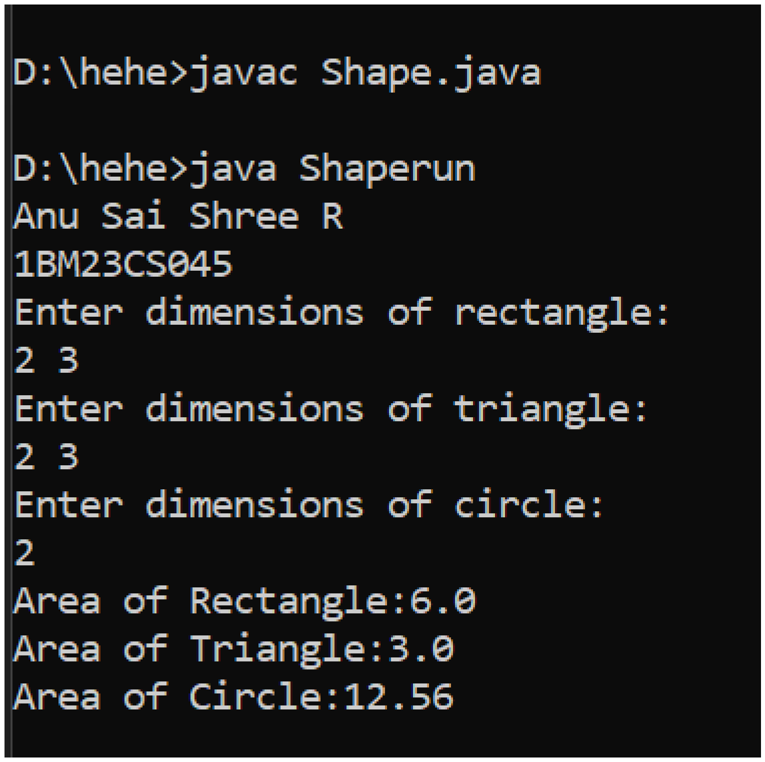
```
Enter dimension
2 3

Enter dimension
2 3

Enter dimensions
2

Area of Rectangle:6.0
Area of Triangle:3.0
Area of circle : 12.56
```

[illegible]
23-10-24

Code:

```
import java.util.Scanner;

abstract class Shape {
    int dim1, dim2;
    double area;
    Scanner s = new Scanner(System.in);
    abstract void printarea();
}

class Rectangle extends Shape {
    Rectangle() {
        System.out.println("Enter dimensions of rectangle:");
        dim1 = s.nextInt();
        dim2 = s.nextInt();
    }
    void printarea() {
        area = dim1 * dim2;
        System.out.println("Area of Rectangle:" + area);
    }
}

class Triangle extends Shape {
    Triangle() {
        System.out.println("Enter dimensions of triangle:");
        dim1 = s.nextInt();
        dim2 = s.nextInt();

    }
    void printarea() {
        area = (dim1 * dim2) / 2.0;
        System.out.println("Area of Triangle:" + area);
    }
}

class Circle extends Shape {
    Circle() {
        System.out.println("Enter dimensions of circle:");
        dim1 = s.nextInt();

    }
    void printarea() {
        area = 3.14 * dim1 * dim1;
        System.out.println("Area of Circle:" + area);
    }
}

class Shaperun {
    public static void main(String args[]) {
        System.out.println("Anu Sai Shree R\n1BM23CS045");
        Rectangle r = new Rectangle();
        Triangle t = new Triangle();
        Circle c = new Circle();
        r.printarea();
        t.printarea();
        c.printarea();
    }
}
```

Output:



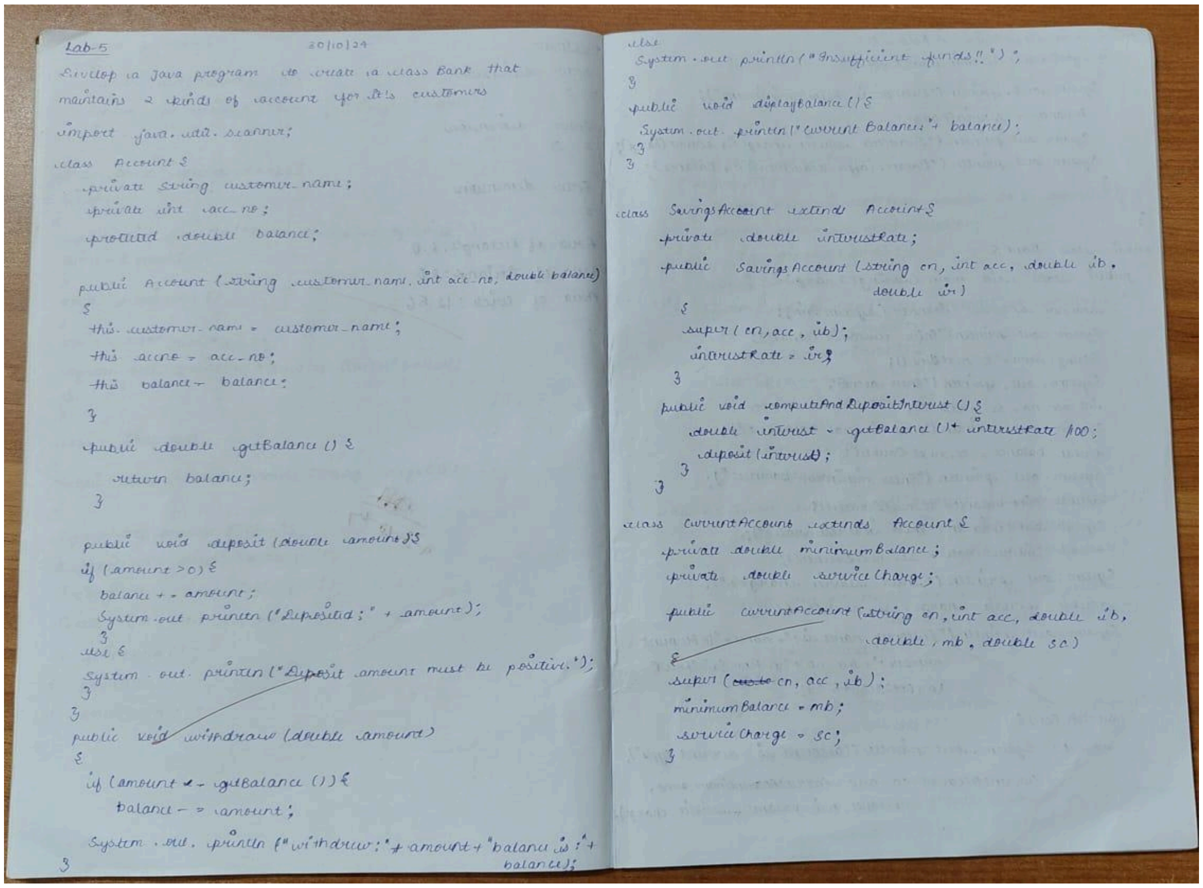
```
D:\hehe>javac Shape.java

D:\hehe>java Shaperun
Anu Sai Shree R
1BM23CS045
Enter dimensions of rectangle:
2 3
Enter dimensions of triangle:
2 3
Enter dimensions of circle:
2
Area of Rectangle:6.0
Area of Triangle:3.0
Area of Circle:12.56
```

Program 5

Implementation of Bank

program to create a class Bank that maintains two kinds of account for its customers, one called savings account and the other current account. The savings account provides compound interest and withdrawal facilities but no cheque book facility. The current account provides cheque book facility but no interest. Current account holders should also maintain a minimum balance and if the balance falls below this level, a service charge is imposed. Create a class Account that stores customer name, account number and type of account. From this derive the classes Cur-acct and Sav-acct to make them more specific to their requirements. Include the necessary methods in order to achieve the following tasks: a) Accept deposit from customer and update the balance. b) Display the balance. c) Compute and deposit interest d) Permit withdrawal and update the balance Check for the minimum balance, impose penalty if necessary and update the balance.

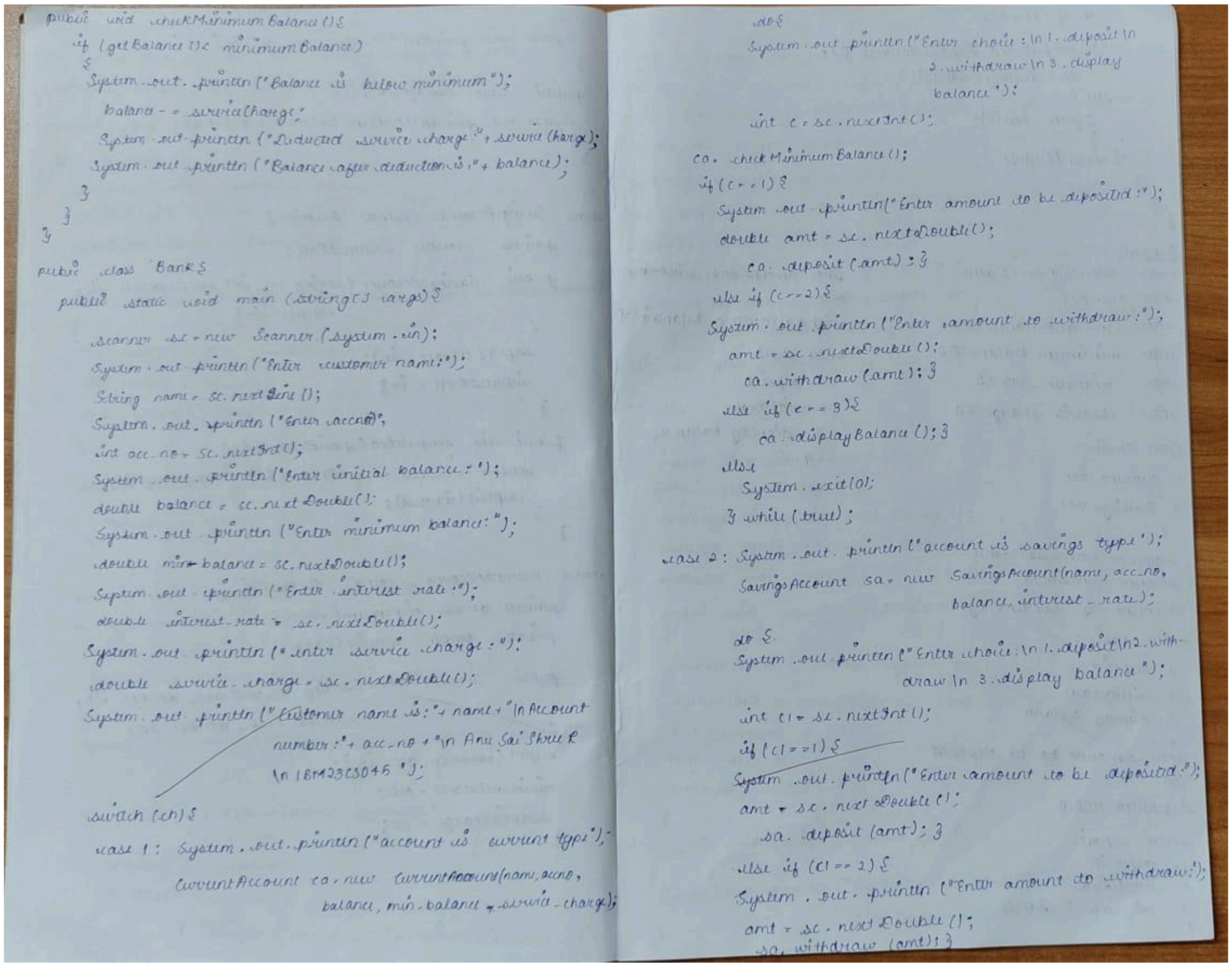
Algorithm:



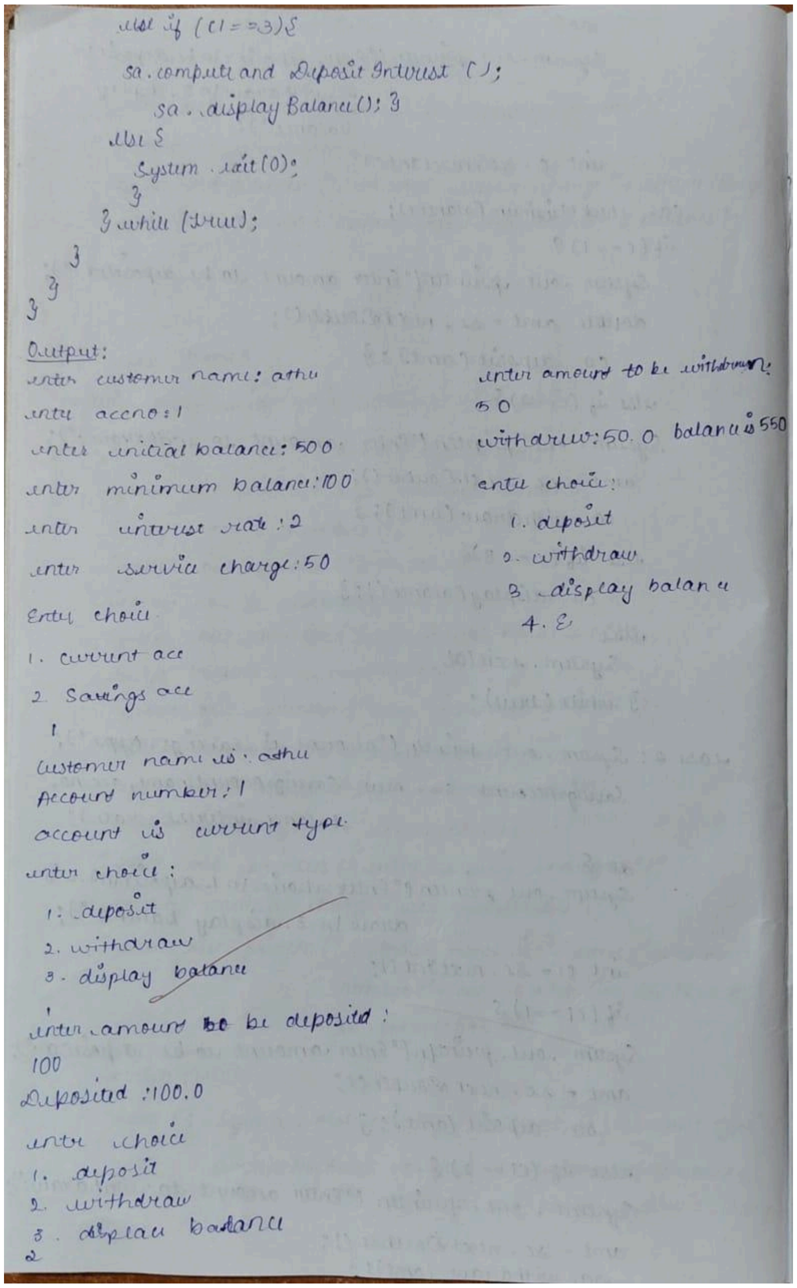
Lab-5 30/10/24

Develop a Java program to create a class Bank that maintains 2 kinds of account for it's customers

```
import java.util.scanner;
class Account {
  private String customer_name;
  private int acc_no;
  protected double balance;

  public Account (String customer_name, int acc_no, double balance)
  {
   this.customer_name = customer_name;
   this.accno = acc_no;
   this.balance = balance;
  }
  public double getBalance () {
     return balance;
  }

  public void deposit (double amount){
  if (amount >0) {
   balance += amount;
   System.out.println ("Deposited:" + amount);
   }
  else {
  System.out.println ("Deposit amount must be positive.");
  }
 }
 public void withdraw (double amount)
 {
  if (amount <= getBalance ()) {
     balance -= amount;
  System.out.println ("withdrew:" + amount + "balance is :" +
                                              balance);
 }
else
 System.out.println ("Insufficient funds!!");
}
public void displayBalance () {
 System.out.println ("current Balance:" + balance);
 }
}

class SavingsAccount extends Account {
    private double interestRate;
    public SavingsAccount (String cn, int acc, double ib,
                                      double ir)
      {
      super (cn, acc, ib);
      interestRate = ir;
     }
    public void computeAndDepositInterest () {
      double interest = getBalance ()* interestRate /100;
      deposit (interest);
     }
   }

class CurrentAccount extends Account {
   private double minimumBalance;
   private double serviceCharge;

   public currentAccount (String cn, int acc, double ib,
                                  double, mb, double sc)
   {
   super (~~cust~~ cn, acc, ib);
   minimumBalance = mb;
   serviceCharge = sc;
   }
```



```
public void checkMinimumBalance(){
  if (getBalance()< minimumBalance)
   {
   System.out.println("Balance is below minimum");
    balance -= serviceCharge;
    System.out.println("Deducted service charge:"+ serviceCharge);
   System.out.println("Balance after deduction is:"+ balance);
   }
  }
}

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

   Scanner sc = new Scanner(System.in);
   System.out.println("Enter customer name:");
   String name = sc.nextLine();
   System.out.println("Enter accno");
   int acc_no = sc.nextInt();
   System.out.println("Enter initial balance:");
   double balance = sc.nextDouble();
   System.out.println("Enter minimum balance:");
   double min_balance = sc.nextDouble();
   System.out.println("Enter interest rate:");
   double interest_rate = sc.nextDouble();
  System.out.println("enter service charge:");
  double service_charge = sc.nextDouble();
  System.out.println("Customer name is:"+ name+"\n Account
                   number:"+ acc_no +"\n Anu Sai Shree R
                   \n 18M23CS045 ");

  switch (ch){
   case 1:  System.out.println("account is current type");
            CurrentAccount ca = new CurrentAccount(name, accno,
                        balance, min_balance, service_charge);
            do{
            System.out.println("Enter choice: \n 1. deposit \n
                                 2. withdraw \n 3. display
                                 balance");
            int c = sc.nextInt();
        ca. checkMinimumBalance();
        if (c==1){
         System.out.println("Enter amount to be deposited:");
         double amt = sc.nextDouble();
           ca.deposit(amt);}
         else if (c==2){
        System.out.println("Enter amount to withdraw:");
          amt = sc.nextDouble();
           ca.withdraw(amt);}
         else if (c==3){
            ca.displayBalance();}
         else
           System.exit(0);
         } while (true);
  case 2: System.out.println("account is savings type");
          SavingsAccount sa = new SavingsAccount(name, acc_no,
                               balance, interest_rate);

          do {
          System.out.println("Enter choice: \n 1. deposit\n2. with-
                        draw \n 3. display balance");

           int c1 = sc.nextInt();
           if (c1==1){
          System.out.println("Enter amount to be deposited:");
           amt = sc.nextDouble();
             sa.deposit(amt);}
          else if (c1==2){
          System.out.println("Enter amount to withdraw:");
           amt = sc.nextDouble();
            sa.withdraw(amt);}
```



```
    else if (c1==3){
      sa.compute and Deposit Interest ();
        sa..display Balance(); }
    else {
      System .exit(0);
      }
    } while (true);
  }
 }
}
```

Output:

```
enter customer name: athu
enter accno:1
enter initial balance: 500
enter minimum balance:100
enter interest rate : 2
enter service charge:50
Enter choice
1. current acc
2 Savings acc
 1
customer name is : athu
Account number: 1
account is current type
enter choice :
 1: deposit
 2. withdraw
 3. display balance
enter amount to be deposited :
100
Deposited :100.0
enter choice
1. deposit
2. withdraw
3. display balance
2
```

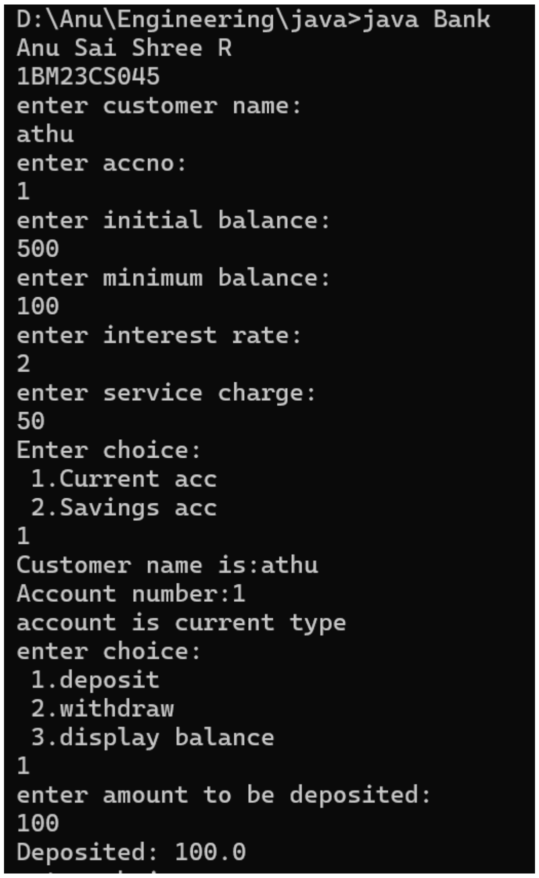
```
enter amount to be withdrawn:
50
withdrew:50.0 balance is 550
enter choice:
  1. deposit
  2. withdraw
  3 display balance
   4. E
```

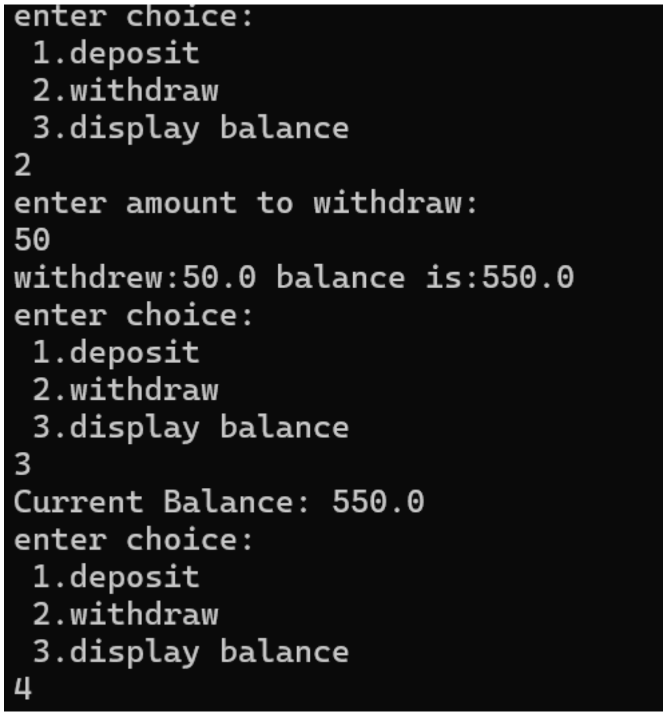
Code:

```
import java.util.Scanner;

class Account {
    private String customer_name;
    private int acc_no;
    protected double balance;

    public Account(String customer_name, int acc_no, double balance) {
        this.customer_name = customer_name;
        this.acc_no = acc_no;
        this.balance = balance;
    }

    public double getBalance() {
        return balance;
    }

    public void deposit(double amount) {
        if (amount > 0) {
            balance += amount;
            System.out.println("Deposited: " + amount);
        } else {
            System.out.println("Deposit amount must be positive.");
        }
    }
   public void withdraw(double amount)
     {
      if(amount<=getBalance()){
         balance-=amount;
         System.out.println("withdrew:"+amount + " balance is:"+ balance);
         }
      else
        System.out.println("Insufficient funds!!");
     }
    public void displayBalance(){
        System.out.println("Current Balance: " + balance);
    }
}

class SavingsAccount extends Account {
    private double interestRate;

    public SavingsAccount(String customerName, int accountNumber, double
initialBalance, double interestRate) {
        super(customerName, accountNumber, initialBalance);
        this.interestRate = interestRate;
    }

    public void computeAndDepositInterest() {
        double interest = getBalance() * interestRate / 100;
        deposit(interest);
    }
}
class CurrentAccount extends Account {
    private double minimumBalance;
    private double serviceCharge;

    public CurrentAccount(String customerName, int accountNumber, double
initialBalance, double minimumBalance, double serviceCharge) {
        super(customerName, accountNumber, initialBalance);
        this.minimumBalance = minimumBalance;
        this.serviceCharge = serviceCharge;
    }
    public void checkMinimumBalance() {
        if (getBalance() < minimumBalance) {
            System.out.println("Balance is below minimum");
            balance-=serviceCharge;
            System.out.println("Deducted service charge:" +serviceCharge);
            System.out.println("Balance after deduction is:"+balance);
        }
    }
}
public class Bank {
    public static void main(String[] args) {
          System.out.println("Anu Sai Shree R\n1BM23CS045");
        Scanner sc = new Scanner(System.in);
        System.out.println("enter customer name:");
        String name=sc.nextLine();
        System.out.println("enter accno:");
        int acc_no=sc.nextInt();
        System.out.println("enter initial balance:");
        double balance=sc.nextDouble();
        System.out.println("enter minimum balance:");
        double minimum_balance=sc.nextDouble();
        System.out.println("enter interest rate:");
        double interest_rate=sc.nextDouble();
        System.out.println("enter service charge:");
        double service_charge=sc.nextDouble();
        System.out.println("Enter choice:\n 1.Current acc\n 2.Savings acc");
        int ch=sc.nextInt();
        System.out.println("Customer name is:"+ name+"\nAccount
number:"+acc_no);

        switch(ch){
           case(1):
              System.out.println("account is current type");
              CurrentAccount ca = new
CurrentAccount(name,acc_no,balance,minimum_balance,service_charge);
             do{ System.out.println("enter choice:\n 1.deposit\n 2.withdraw\n 3.display
balance");
              int c=sc.nextInt();
              ca.checkMinimumBalance();
              if(c==1){
                System.out.println("enter amount to be deposited:");
                double amt=sc.nextDouble();
                  ca.deposit(amt);}
              else if(c==2){
                System.out.println("enter amount to withdraw:");
                double amt=sc.nextDouble();
                ca.withdraw(amt);}
              else if(c==3){
                ca.displayBalance();}
              else
                System.exit(0);
               }while(true);

          case(2):
               System.out.println("account is savings type");
```

```
                SavingsAccount sa=new
SavingsAccount(name,acc_no,balance,interest_rate);
                do{ System.out.println("enter choice:\n 1.deposit\n 2.withdraw\n
3.display balance");
                int c1=sc.nextInt();
                if(c1==1){
                   System.out.println("enter amount to be deposited:");
                   double amt=sc.nextDouble();
                     sa.deposit(amt);}
                else if(c1==2){
                   System.out.println("enter amount to withdraw:");
                   double amt=sc.nextDouble();
                   sa.withdraw(amt);}
                else if(c1==3){
                 sa.computeAndDepositInterest();
                   sa.displayBalance();}
                else{
                  System.exit(0);
                      }
                }while(true);
    }
}
}
```

Output:


```
D:\Anu\Engineering\java>java Bank
Anu Sai Shree R
1BM23CS045
enter customer name:
athu
enter accno:
1
enter initial balance:
500
enter minimum balance:
100
enter interest rate:
2
enter service charge:
50
Enter choice:
 1.Current acc
 2.Savings acc
1
Customer name is:athu
Account number:1
account is current type
enter choice:
 1.deposit
 2.withdraw
 3.display balance
1
enter amount to be deposited:
100
Deposited: 100.0
```

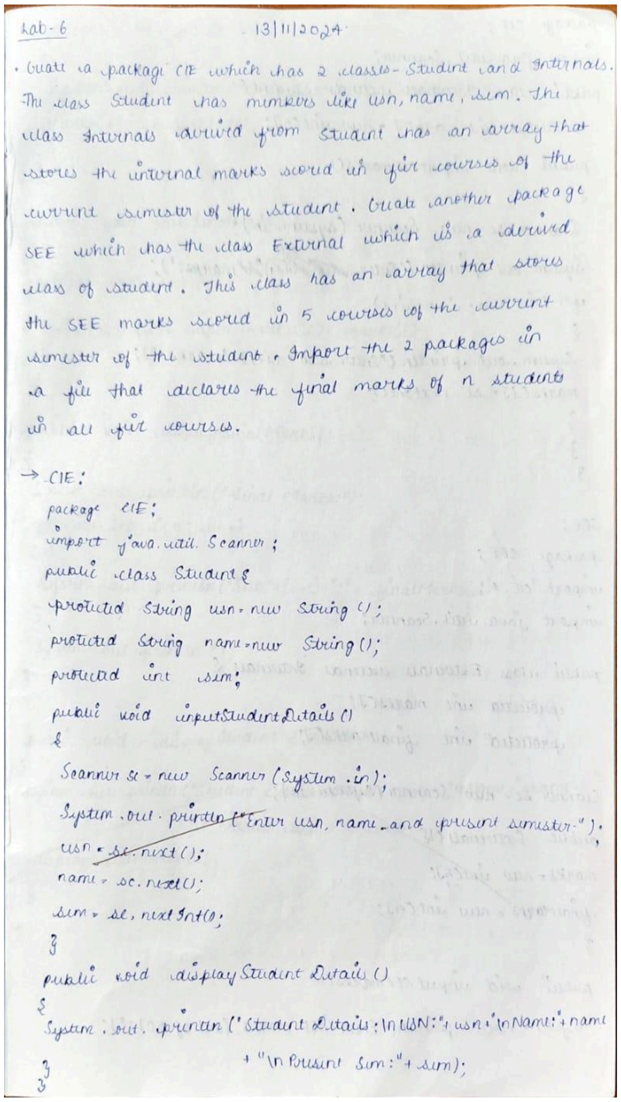

```
enter choice:
 1.deposit
 2.withdraw
 3.display balance
2
enter amount to withdraw:
50
withdrew:50.0 balance is:550.0
enter choice:
 1.deposit
 2.withdraw
 3.display balance
3
Current Balance: 550.0
enter choice:
 1.deposit
 2.withdraw
 3.display balance
4
```

Program 6

Demonstration Of Package

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 a derived class of Student. This class has an array that stores the SEE marks scored in five courses of the current semester of the student. Import the two packages in a file that declares the final marks of n students in all five courses.

<u>Algorithm:</u>

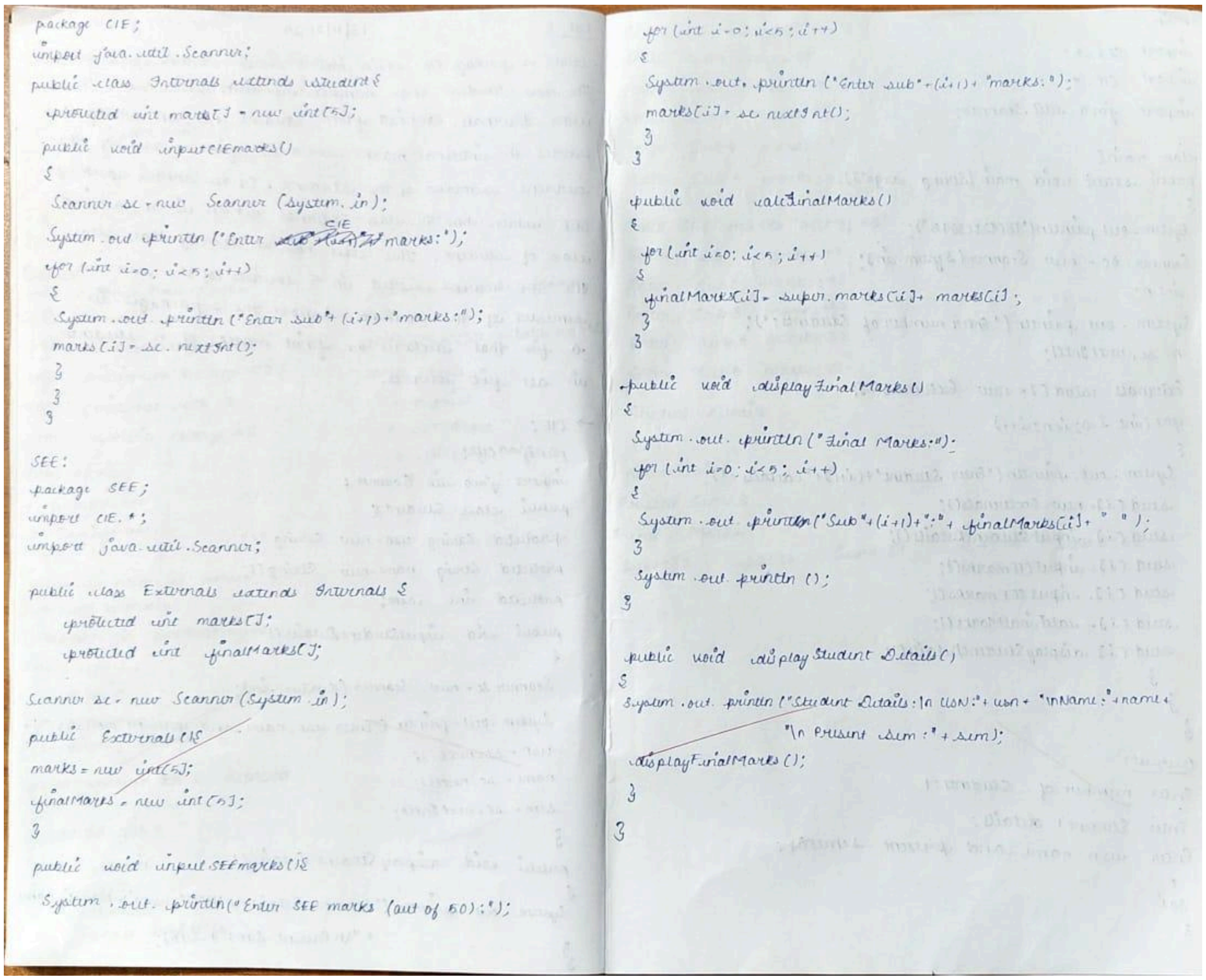


Lab-6 13/11/2024

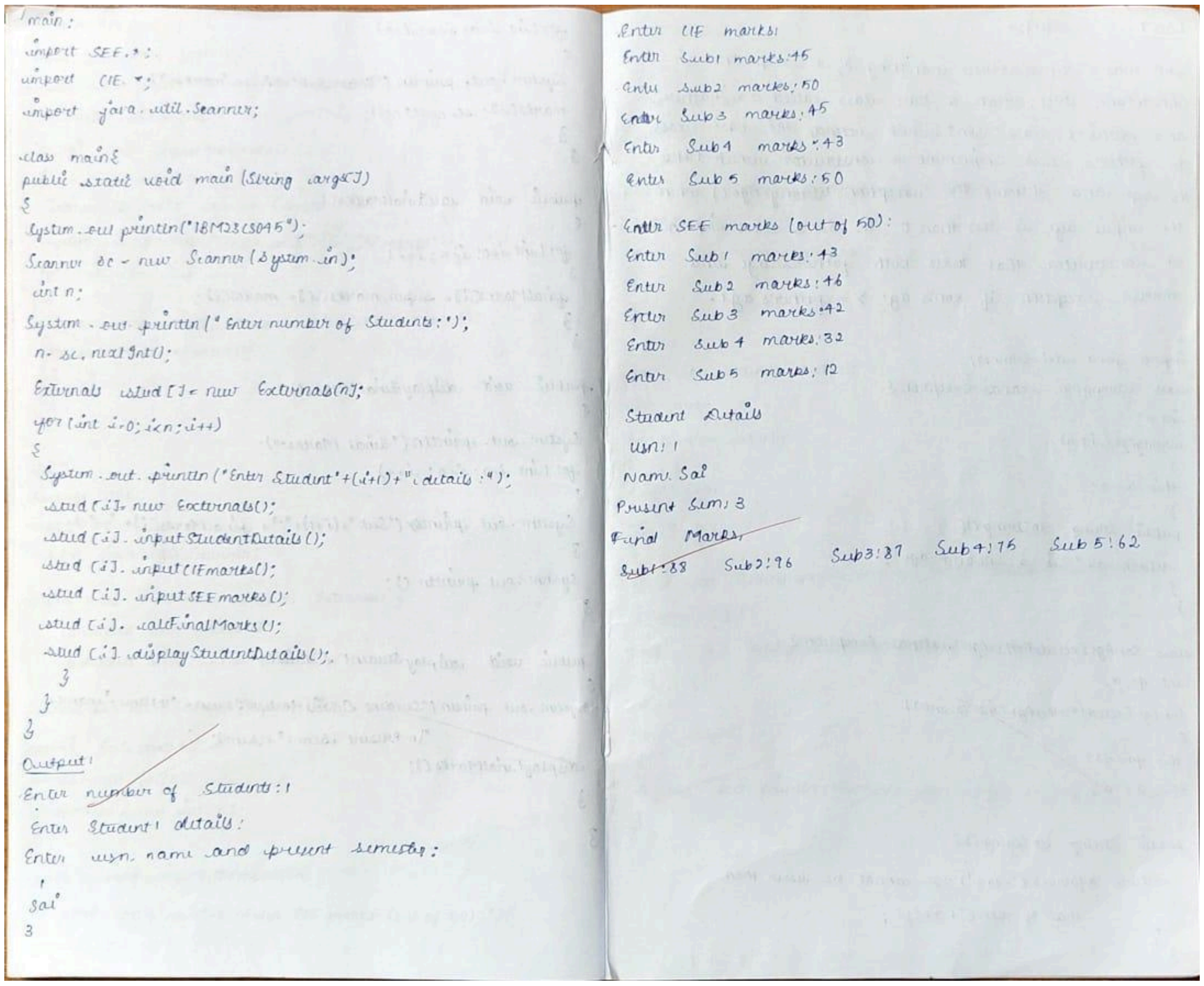
- Create a package CIE which has 2 classes- Student and Internals. The class Student has members like usn, name, sem. The class Internals derived from Student has an array that stores the internal marks scored in five courses of the current semester of the student. Create another package SEE which has the class External which is a derived class of student. This class has an array that stores the SEE marks scored in 5 courses of the current semester of the student. Import the 2 packages in a file that declares the final marks of n students in all five courses.

→ CIE:

```
package CIE;
import java.util.Scanner;
public class Student {
protected String usn=new String();
protected String name=new String();
protected int sem;
public void inputStudentDetails()
{
 Scanner sc = new Scanner(System.in);
 System.out.println("Enter usn, name and present semester:");
 usn = sc.next();
 name = sc.next();
 sem = sc.nextInt();
}
public void displayStudentDetails()
{
System.out.println("Student Details:\nUSN:"+usn+"\nName:"+name
                 +"\nPresent Sem:"+sem);
}
}
```



```
package CIE;
import java.util.Scanner;
public class Internals extends Student{
 protected int marks[] = new int[5];
 public void inputCIEmarks()
 {
  Scanner sc = new Scanner (System.in);
  System.out.println ("Enter CIE marks:");
  for (int i=0; i<5; i++)
  {
   System.out.println ("Enter sub"+ (i+1)+"marks:");
   marks[i] = sc.nextInt();
   }
  }
 }

SEE:
package SEE;
import CIE.*;
import java.util.Scanner;

public class Externals extends Internals {
    protected int marks[];
    protected int finalMarks[];

Scanner sc = new Scanner(System.in);

public Externals(){
marks = new int[5];
finalMarks = new int[5];
}
public void inputSEEmarks(){
 System.out.println("Enter SEE marks (out of 50):");
 for (int i=0; i<5; i++)
 {
  System.out.println ("Enter sub"+(i+1)+"marks:");
  marks[i] = sc.nextInt();
  }
 }

public void calcFinalMarks()
{
 for (int i=0; i<5; i++)
 {
  finalMarks[i] = super.marks[i]+ marks[i];
  }
 }

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

public void displayStudentDetails()
{
System.out.println ("Student Details:\n USN:"+ usn + "\nName:"+name+
                    "\n Present Sem :" + sem);
displayFinalMarks ();
}
}
```



```
main :
import SEE.*;
import CIE.*;
import java.util.Scanner;

class main{
public static void main (String args[])
{
 System.out.println("1BM23CS045");
 Scanner sc = new Scanner(System.in);
  int n;
 System.out.println(" Enter number of Students:");
  n= sc.nextInt();
  Externals stud[]= new Externals[n];
  for (int i=0;i<n;i++)
  {
   System.out.println("Enter Student"+(i+1)+" details :");
   stud[i]= new Externals();
   stud[i].inputStudentDetails();
   stud[i].inputCIEmarks();
   stud[i].inputSEEmarks();
   stud[i].calcFinalMarks();
   stud[i].displayStudentDetails();
    }
  }
}
```

Output:

```
Enter number of Students:1
 Enter Student1 details:
Enter usn, name and present semester:
 1
 sai
 3
```

```
Enter CIE marks:
 Enter Sub1 marks:45
 Enter Sub2 marks:50
 Enter Sub3 marks:45
 Enter Sub4 marks:43
 Enter Sub5 marks:50

 Enter SEE marks (out of 50):
 Enter Sub1 marks:43
 Enter Sub2 marks:46
 Enter Sub3 marks:42
 Enter Sub4 marks:32
 Enter Sub5 marks:12

 Student Details
 usn: 1
 Name: Sai
Present Sem: 3
Final Marks:
Sub1:88   Sub2:96   Sub3:87   Sub4:75   Sub5:62
```

<u>Code:</u>

- CIE
    - o Student.java

```
package CIE;
import java.util.Scanner;
public class Student {
   protected String usn = new String();
   protected String name = new String();
   protected int sem;
   public void inputStudentDetails() {
      Scanner sc = new Scanner(System.in);
      System.out.println("Enter usn,name and present semester :");
```

```
        usn = sc.next();
        name = sc.next();
        sem = sc.nextInt();
    }
    public void displayStudentDetails() {
        System.out.println("Student details:\nUsn:" + usn + "\nName:" + name +
"\nPresent Sem:" + sem);
    }
}
```

- Internals.java

```
package CIE;
import java.util.Scanner;
public class Internals extends Student {
    protected int marks[] = new int[5];
    public void inputCIEmarks() {
        Scanner sc = new Scanner(System.in);
        System.out.println("Enter CIE marks:");
        for (int i = 0; i < 5; i++) {
            System.out.println("Enter sub" + (i + 1) + "marks:");
            marks[i] = sc.nextInt();
        }

    }
}
```

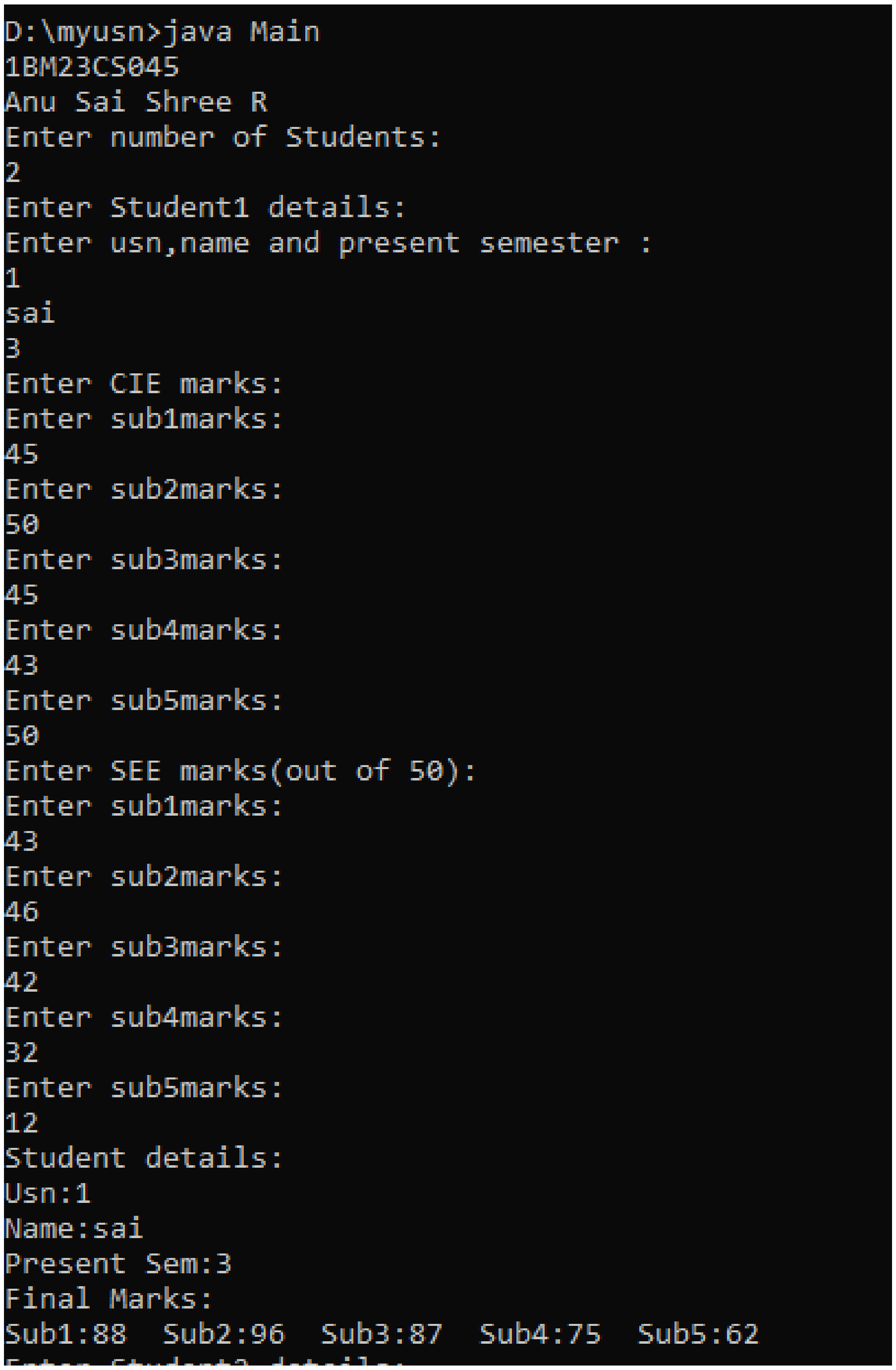
- SEE
  - Externals.java

```
package SEE;
import CIE.*;
import java.util.Scanner;

public class Externals extends Internals {
    protected int marks[];
    protected int finalMarks[];
    Scanner sc = new Scanner(System.in);
    public Externals() {
        marks = new int[5];
        finalMarks = new int[5];
    }

    public void inputSEEmarks() {

        System.out.println("Enter SEE marks(out of 50):");
        for (int i = 0; i < 5; i++) {
            System.out.println("Enter sub" + (i + 1) + "marks:");
            marks[i] = sc.nextInt();
        }
    }

    public void calcFinalMarks() {
        for (int i = 0; i < 5; i++) {
            finalMarks[i] = super.marks[i] + marks[i];
        }
    }

    public void displayFinalMarks() {
        System.out.println("Final Marks:");
        for (int i = 0; i < 5; i++) {
            System.out.print("Sub" + (i + 1) + ":" + finalMarks[i] + "  ");
        }

        System.out.println();
    }

    public void displayStudentDetails() {
        System.out.println("Student details:\nUsn:" + usn + "\nName:" + name +
"\nPresent Sem:" + sem);
        displayFinalMarks();
    }
}
```

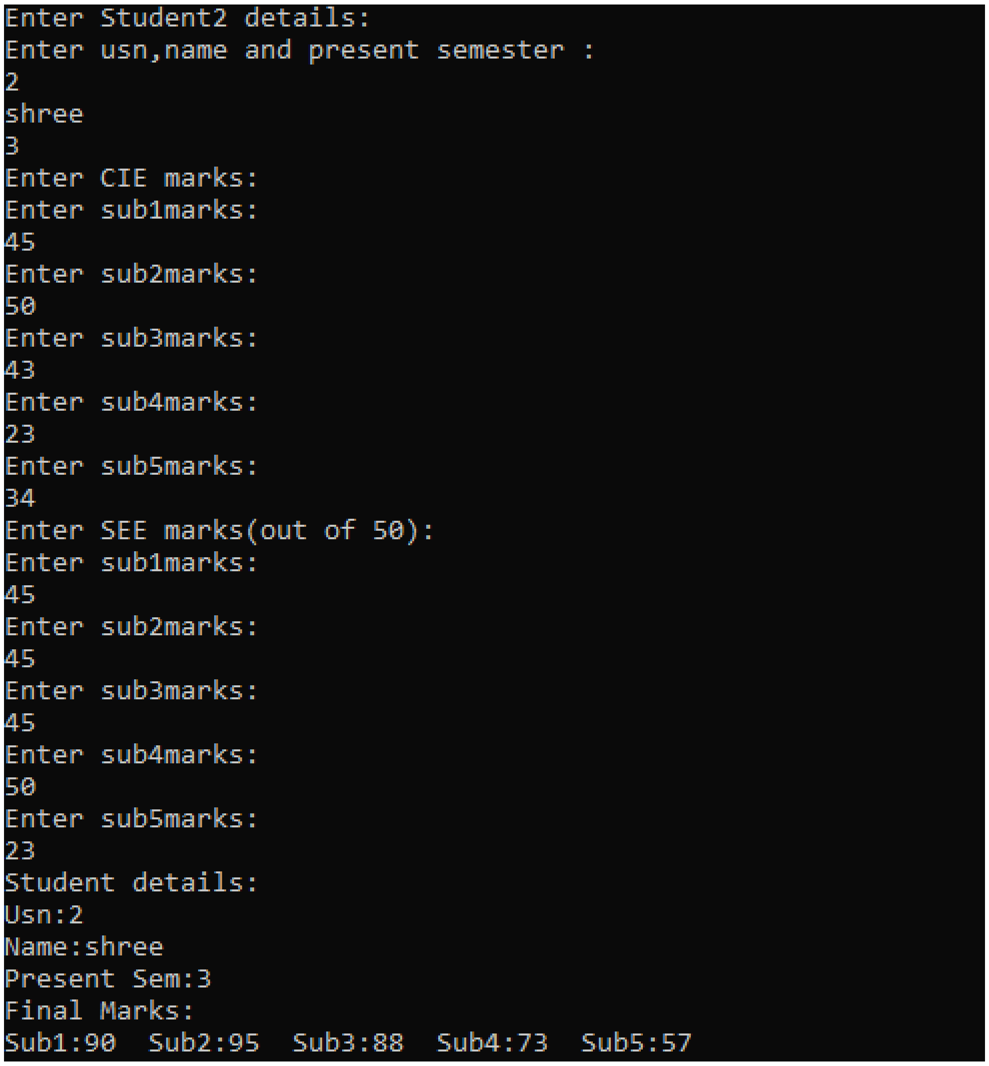
- main.java

```
import SEE.*;
import CIE.*;
import java.util.Scanner;

class Main {
   public static void main(String args[]) {
      System.out.println("1BM23CS045\nAnu Sai Shree R");
      Scanner sc = new Scanner(System.in);
      int n;
      System.out.println("Enter number of Students:");
      n = sc.nextInt();
      Externals stud[] = new Externals[n];
      for (int i = 0; i < n; i++) {
         System.out.println("Enter Student" + (i + 1) + " details:");
         stud[i] = new Externals();
         stud[i].inputStudentDetails();
         stud[i].inputCIEmarks();
         stud[i].inputSEEmarks();
         stud[i].calcFinalMarks();
         stud[i].displayStudentDetails();

      }
   }
}
```

Output:



```
D:\myusn>java Main
1BM23CS045
Anu Sai Shree R
Enter number of Students:
2
Enter Student1 details:
Enter usn,name and present semester :
1
sai
3
Enter CIE marks:
Enter sub1marks:
45
Enter sub2marks:
50
Enter sub3marks:
45
Enter sub4marks:
43
Enter sub5marks:
50
Enter SEE marks(out of 50):
Enter sub1marks:
43
Enter sub2marks:
46
Enter sub3marks:
42
Enter sub4marks:
32
Enter sub5marks:
12
Student details:
Usn:1
Name:sai
Present Sem:3
Final Marks:
Sub1:88  Sub2:96  Sub3:87  Sub4:75  Sub5:62
```

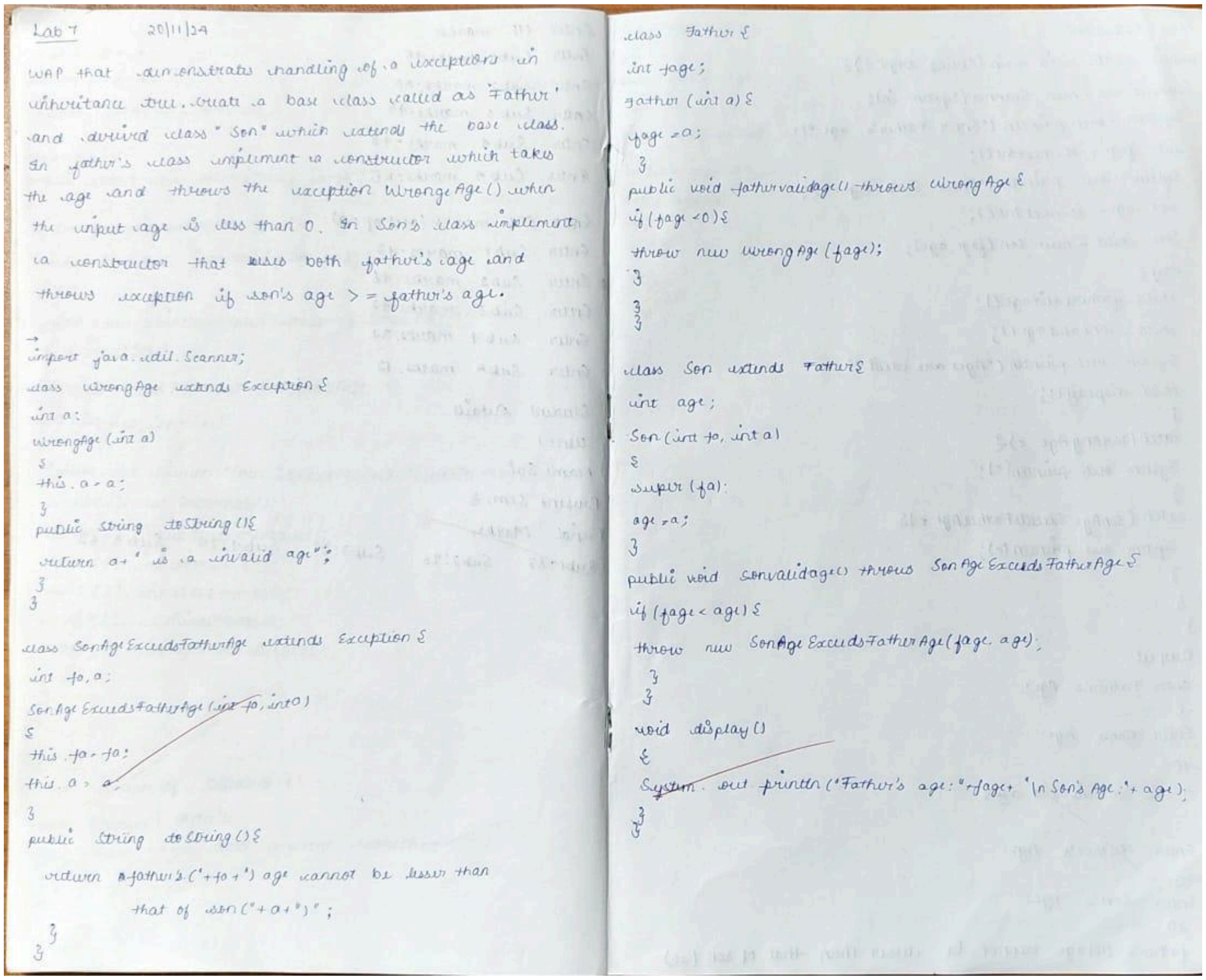

```
Enter Student2 details:
Enter usn,name and present semester :
2
shree
3
Enter CIE marks:
Enter sub1marks:
45
Enter sub2marks:
50
Enter sub3marks:
43
Enter sub4marks:
23
Enter sub5marks:
34
Enter SEE marks(out of 50):
Enter sub1marks:
45
Enter sub2marks:
45
Enter sub3marks:
45
Enter sub4marks:
50
Enter sub5marks:
23
Student details:
Usn:2
Name:shree
Present Sem:3
Final Marks:
Sub1:90  Sub2:95  Sub3:88  Sub4:73  Sub5:57
```

Program 7

Demonstration Of Exception Handling

program that demonstrates handling of exceptions in inheritance tree. Create a base class called “Father” and derived class called “Son” which extends the base class. In Father class, implement a constructor which takes the age and throws the exception WrongAge( ) when the input age=father’s age.

<u>Algorithm:</u>



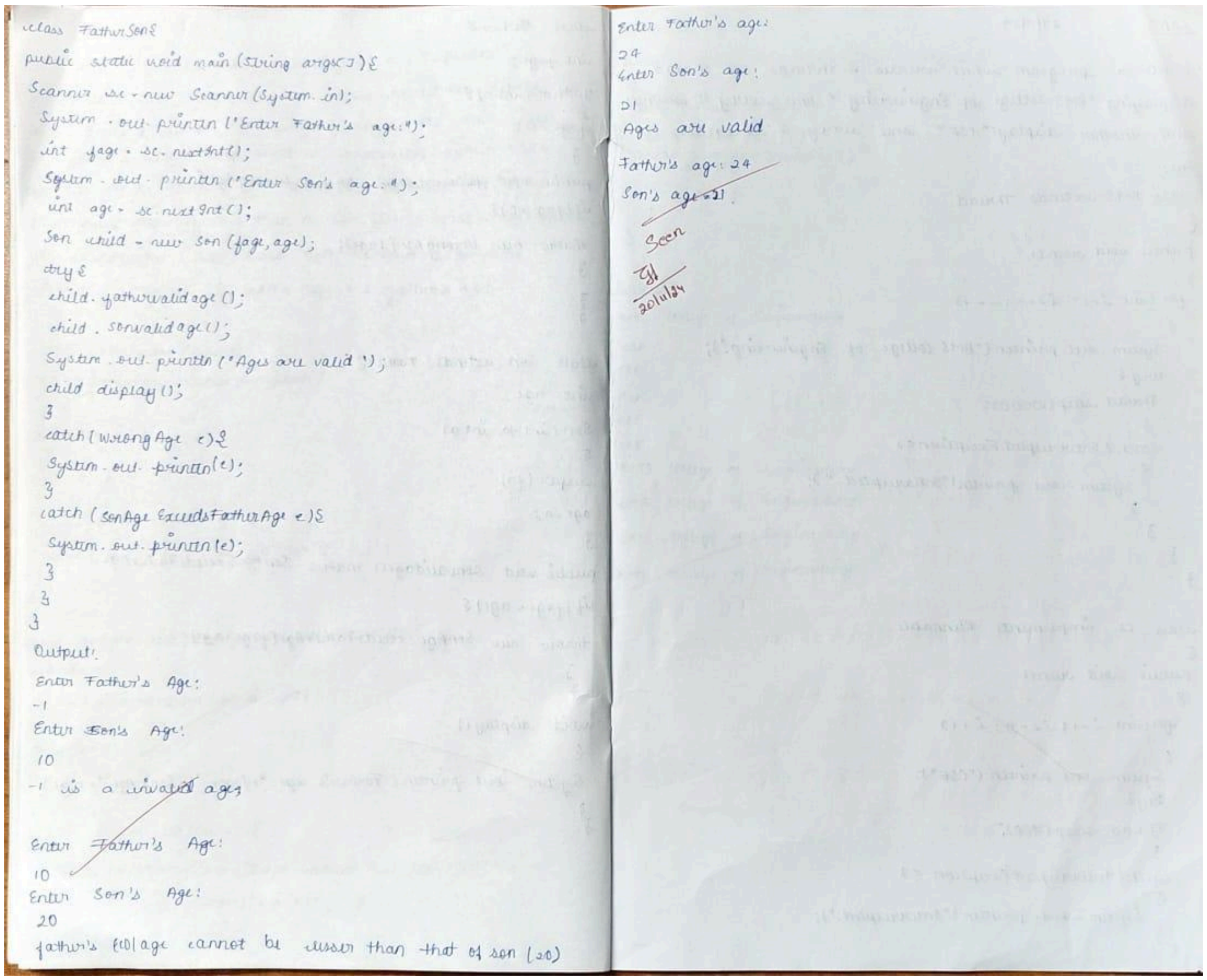
Lab 7 20/11/24

WAP that demonstrates handling of a exceptions in inheritance tree. create a base class called as 'Father' and derived class "Son" which extends the base class. In father's class implement a constructor which takes the age and throws the exception WrongeAge() when the input age is less than 0. In Son's class implement a constructor that uses both father's age and throws exception if son's age > = father's age.

→

```
import java.util.Scanner;
class WrongAge extends Exception {
int a;
WrongAge (int a)
{
this.a = a;
}
public String toString(){
return a+" is a invalid age";
}
}

class SonAgeExceedsFatherAge extends Exception {
int fa, a;
SonAgeExceedsFatherAge (int fa, int a)
{
this.fa = fa;
this.a = a;
}
public String toString(){
return "father's ("+fa+") age cannot be lesser than
        that of son ("+a+")";
}
}
```

```
class Father {
int fage;
Father (int a) {
fage = a;
}
public void fathervalidage() throws WrongAge {
if (fage <0) {
throw new WrongAge (fage);
}
}
}

class Son extends Father {
int age;
Son (int fa, int a)
{
super (fa);
age = a;
}
public void sonvalidage() throws SonAgeExceedsFatherAge {
if (fage < age) {
throw new SonAgeExceedsFatherAge(fage, age);
}
}
void display()
{
System.out.println("Father's age:"+fage+"\n Son's Age:"+ age);
}
}
```



```
class FatherSon{
public static void main(String args[]){
 Scanner sc = new Scanner(System.in);
  System.out.println("Enter Father's age:");
  int fage = sc.nextInt();
  System.out.println("Enter Son's age:");
  int age = sc.nextInt();
  Son child = new Son(fage,age);
  try{
   child.fathervalidage();
   child.sonvalidage();
   System.out.println("Ages are valid");
   child display();
  }
  catch(WrongAge e){
   System.out.println(e);
  }
  catch(SonAgeExceedsFatherAge e){
   System.out.println(e);
  }
 }
}
Output:
Enter Father's Age:
-1
Enter Son's Age:
10
-1 is a invalid ages

Enter Father's Age:
10
Enter Son's Age:
20
father's (10) age cannot be lesser than that of son (20)
```

```
Enter Father's age:
24
Enter Son's age:
21
Ages are valid
Father's age: 24
Son's age=21.
```

Seen
[illegible]
20/11/24

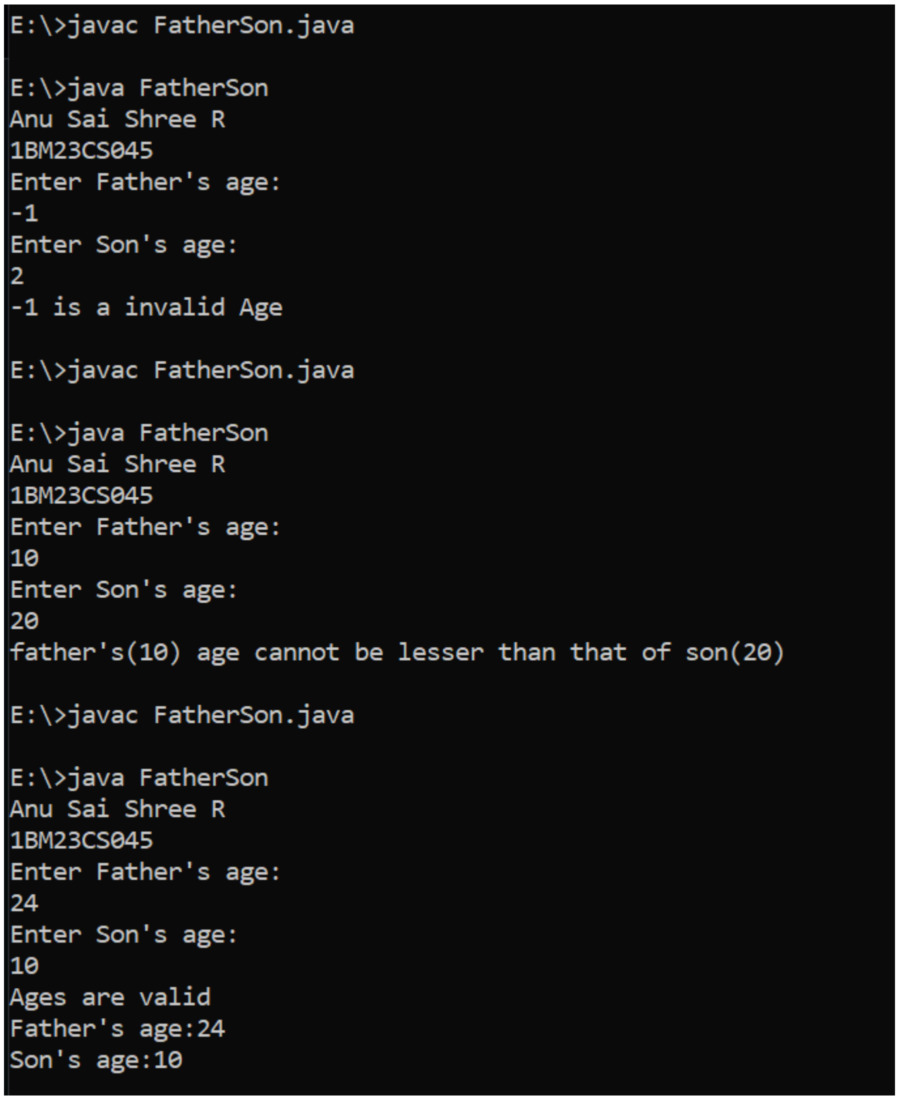
Code:

```
import java.util.Scanner;
class WrongAge extends Exception {
   int a;
   WrongAge(int a) {
      this.a = a;
   }
   public String toString() {
      return a + " is a invalid Age";
   }
}

class SonAgeExceedsFatherAge extends Exception {
   int fa, a;
```

```
    SonAgeExceedsFatherAge(int fa, int a) {
        this.fa = fa;
        this.a = a;
    }

    public String toString() {
        return "father's(" + fa + ") age cannot be lesser than that of son(" + a + ")";
    }
}

class Father {
    int fage;
    Father(int a) {
        fage = a;
    }
    public void fathervalidage() throws WrongAge {
        if (fage < 0) {
            throw new WrongAge(fage);
        }
    }
}

class Son extends Father {
    int age;
    Son(int fa, int a) {
        super(fa);
        age = a;
    }
    public void sonvalidage() throws SonAgeExceedsFatherAge {
        if (fage < age) {
            throw new SonAgeExceedsFatherAge(fage, age);
        }
    }
    void display() {
        System.out.println("Father's age:" + fage + "\nSon's age:" + age);
    }
}
```

```
class FatherSon {
   public static void main(String args[]) {
      Scanner sc = new Scanner(System.in);
      System.out.println("Anu Sai Shree R\n1BM23CS045");
      System.out.println("Enter Father's age:");
      int fage = sc.nextInt();
      System.out.println("Enter Son's age:");
      int age = sc.nextInt();
      Son child = new Son(fage, age);
      try {
         child.fathervalidage();
         child.sonvalidage();
         System.out.println("Ages are valid");
         child.display();
      } catch (WrongAge e) {
         System.out.println(e);
      } catch (SonAgeExceedsFatherAge e) {
         System.out.println(e);
      }
   }
}
```

Output:



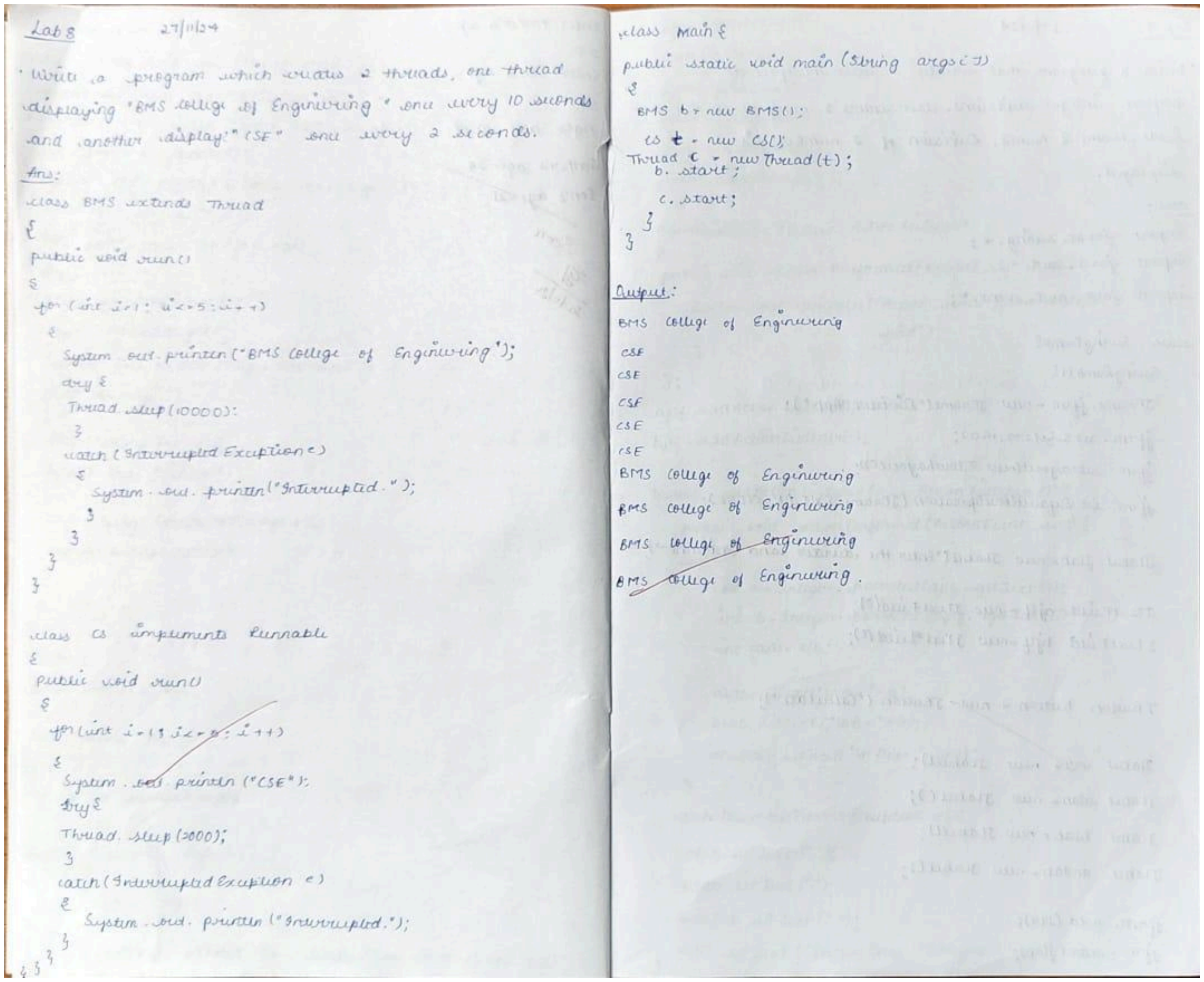
```
E:\>javac FatherSon.java

E:\>java FatherSon
Anu Sai Shree R
1BM23CS045
Enter Father's age:
-1
Enter Son's age:
2
-1 is a invalid Age

E:\>javac FatherSon.java

E:\>java FatherSon
Anu Sai Shree R
1BM23CS045
Enter Father's age:
10
Enter Son's age:
20
father's(10) age cannot be lesser than that of son(20)

E:\>javac FatherSon.java

E:\>java FatherSon
Anu Sai Shree R
1BM23CS045
Enter Father's age:
24
Enter Son's age:
10
Ages are valid
Father's age:24
Son's age:10
```

Program 8

Demonstration Of Threads

program which creates two threads, one thread displaying “BMS College of Engineering” once every ten seconds and another displaying “CSE” once every two seconds.

<u>Algorithm:</u>



Lab 8 27/11/24

Write a program which creates 2 threads, one thread displaying "BMS College of Engineering" once every 10 seconds and another display "CSE" once every 2 seconds.

Ans:

```
class BMS extends Thread
{
public void run()
{
 for (int i=1; i<=5; i++)
  {
   System.out.println("BMS College of Engineering");
   try {
   Thread.sleep(10000);
   }
   catch (InterruptedException e)
    {
     System.out.println("Interrupted.");
    }
   }
  }
}

class CS implements Runnable
{
public void run()
 {
  for (int i=1; i<=5; i++)
  {
   System.out.println("CSE");
   try {
   Thread.sleep(2000);
   }
   catch (InterruptedException e)
   {
     System.out.println("Interrupted.");
   }
  }
}}
```

```
class Main {
public static void main (String args[])
 {
  BMS b = new BMS();
   CS t = new CS();
 Thread c = new Thread(t);
   b.start;
   c.start;
  }
}
```

Output:

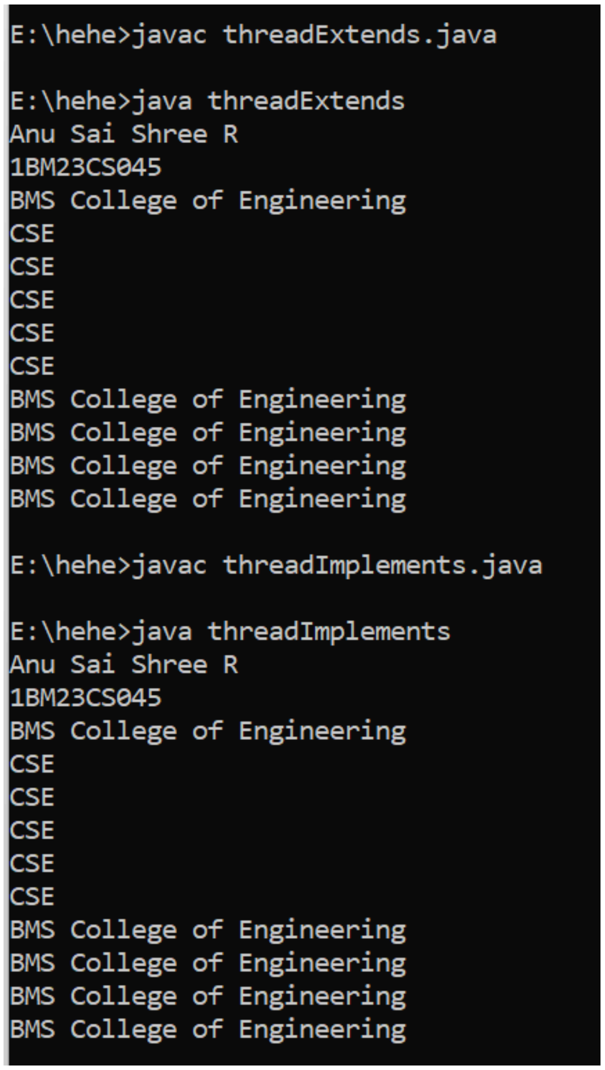
```
BMS College of Engineering
CSE
CSE
CSE
CSE
CSE
BMS College of Engineering
BMS College of Engineering
BMS College of Engineering
BMS College of Engineering.
```

<u>Code:</u>

```
class BMS extends Thread {
   public void run() {
      for (int i = 1; i <= 5; i++) {
         System.out.println("BMS College of Engineering");
```

```
            try {
                Thread.sleep(10000);
            } catch (InterruptedException e) {
                System.out.println("interrupted.");
            }
        }
    }
}

class CS extends Thread {
    public void run() {
        for (int i = 1; i <= 5; i++) {
            System.out.println("CSE");
            try {
                Thread.sleep(2000);
            } catch (InterruptedException e) {
                System.out.println("interrupted.");
            }
        }
    }
}

class threadExtends {
    public static void main(String args[]) {
        System.out.println("Anu Sai Shree R\n1BM23CS045");
        BMS b = new BMS();
        CS c = new CS();
        b.start();
        c.start();

    }
}
```

Output:

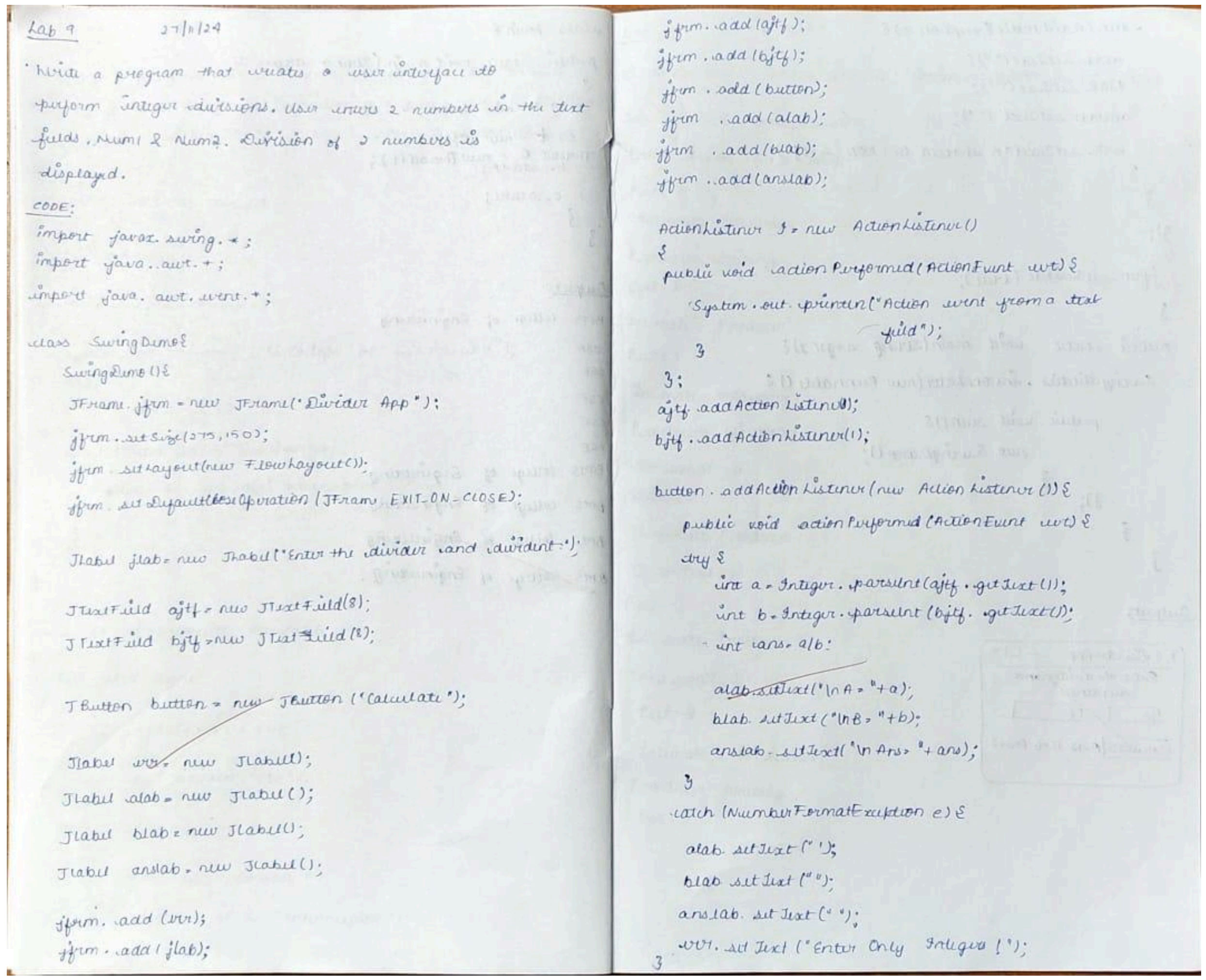

```
E:\hehe>javac threadExtends.java

E:\hehe>java threadExtends
Anu Sai Shree R
1BM23CS045
BMS College of Engineering
CSE
CSE
CSE
CSE
CSE
BMS College of Engineering
BMS College of Engineering
BMS College of Engineering
BMS College of Engineering

E:\hehe>javac threadImplements.java

E:\hehe>java threadImplements
Anu Sai Shree R
1BM23CS045
BMS College of Engineering
CSE
CSE
CSE
CSE
CSE
BMS College of Engineering
BMS College of Engineering
BMS College of Engineering
BMS College of Engineering
```

Program 9

User Interface for division of 2 Numbers(Open Ended Exercise)

program that creates a user interface to perform integer divisions. The user enters two numbers in the text fields, Num1 and Num2. The division of Num1 and Num2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, the program would throw a NumberFormatException. If Num2 were Zero, the program would throw an Arithmetic Exception Display the exception in a message dialog box.

<u>Algorithm:</u>



Lab 9 27/11/24

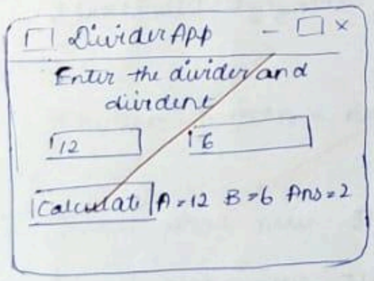
Write a program that creates a user interface to perform integer divisions. User enters 2 numbers in the text fields, Num1 & Num2. Division of 2 numbers is displayed.

CODE:

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

class SwingDemo{
    SwingDemo(){
     JFrame jfrm = new JFrame("Divider App");
     jfrm.setSize(275,150);
     jfrm.setLayout(new FlowLayout());
     jfrm.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);

     JLabel jlab= new JLabel("Enter the divider and divident:");

     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(err);
    jfrm.add(jlab);
```

```
jfrm..add(ajtf);
jfrm.add(bjtf);
jfrm.add(button);
jfrm.add(alab);
jfrm.add(blab);
jfrm..add(anslab);

ActionListener l = new ActionListener()
{
public void actionPerformed(ActionEvent evt){
   System.out.println("Action event from a text
                                   field");
  }
 };
ajtf.addActionListener(l);
bjtf.addActionListener(l);

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("\n A= "+a);
       blab.setText("\nB= "+b);
       anslab.setText("\n Ans= "+ans);
   }
  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();
       }
     });
  }
}
```

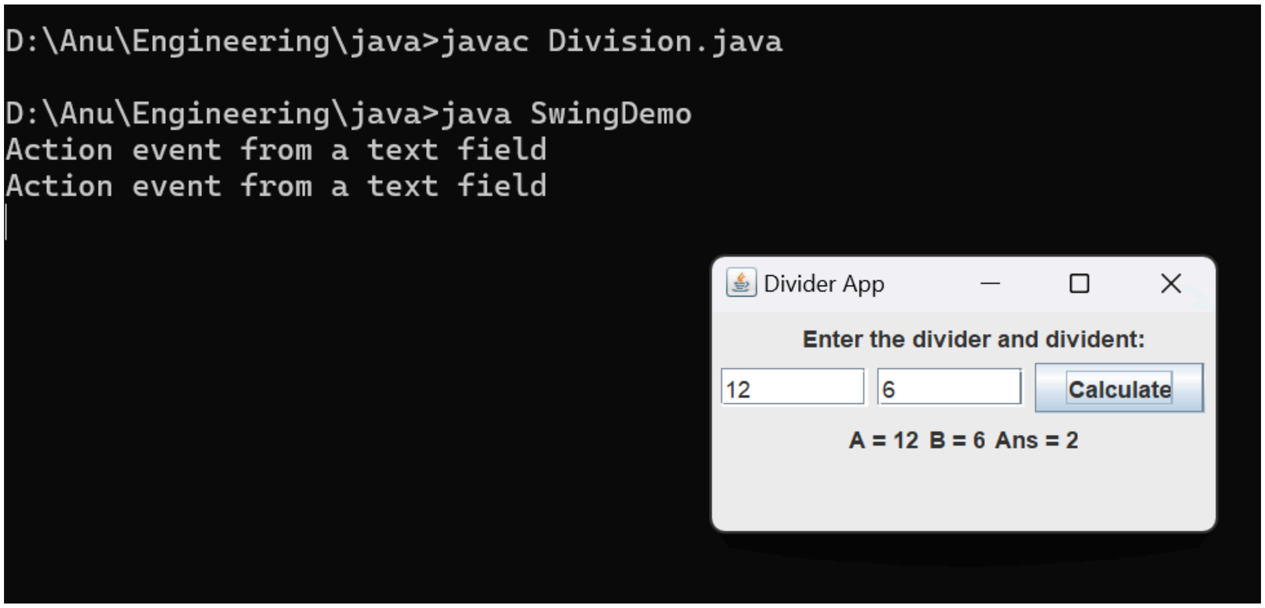
Output:



Code:

```
import javax.swing.*;
import java.awt.*;
import java.awt.event.*;
class SwingDemo {
   SwingDemo() {
      // create jframe container
      JFrame jfrm = new JFrame("Divider App");
      jfrm.setSize(275, 150);
      jfrm.setLayout(new FlowLayout());
      // to terminate on close
      jfrm.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
      // text label
      JLabel jlab = new JLabel("Enter the divider and divident:");
      // add text field for both numbers
      JTextField ajtf = new JTextField(8);
      JTextField bjtf = new JTextField(8);
      // calc button
      JButton button = new JButton("Calculate");
      // labels
      JLabel err = new JLabel();
      JLabel alab = new JLabel();
      JLabel blab = new JLabel();

      JLabel anslab = new JLabel();
      // add in order :)
      jfrm.add(err); // to display error bois
      jfrm.add(jlab);
      jfrm.add(ajtf);
      jfrm.add(bjtf);
      jfrm.add(button);
      jfrm.add(alab);
      jfrm.add(blab);
      jfrm.add(anslab);
      ActionListener l = new ActionListener() {
         public void actionPerformed(ActionEvent evt) {
            System.out.println("Action event from a text field");
            }
        };
        ajtf.addActionListener(l);
        bjtf.addActionListener(l);
        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("\nA = " + a);
                    blab.setText("\nB = " + b);
                    anslab.setText("\nAns = " + ans);
                } 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!");
                }
            }
        });
        // display frame
        jfrm.setVisible(true);
    }
    public static void main(String args[]) {
        // create frame on event dispatching thread
        SwingUtilities.invokeLater(new Runnable() {
            public void run() {
                new SwingDemo();
            }
        });
    }
}
```

Output:

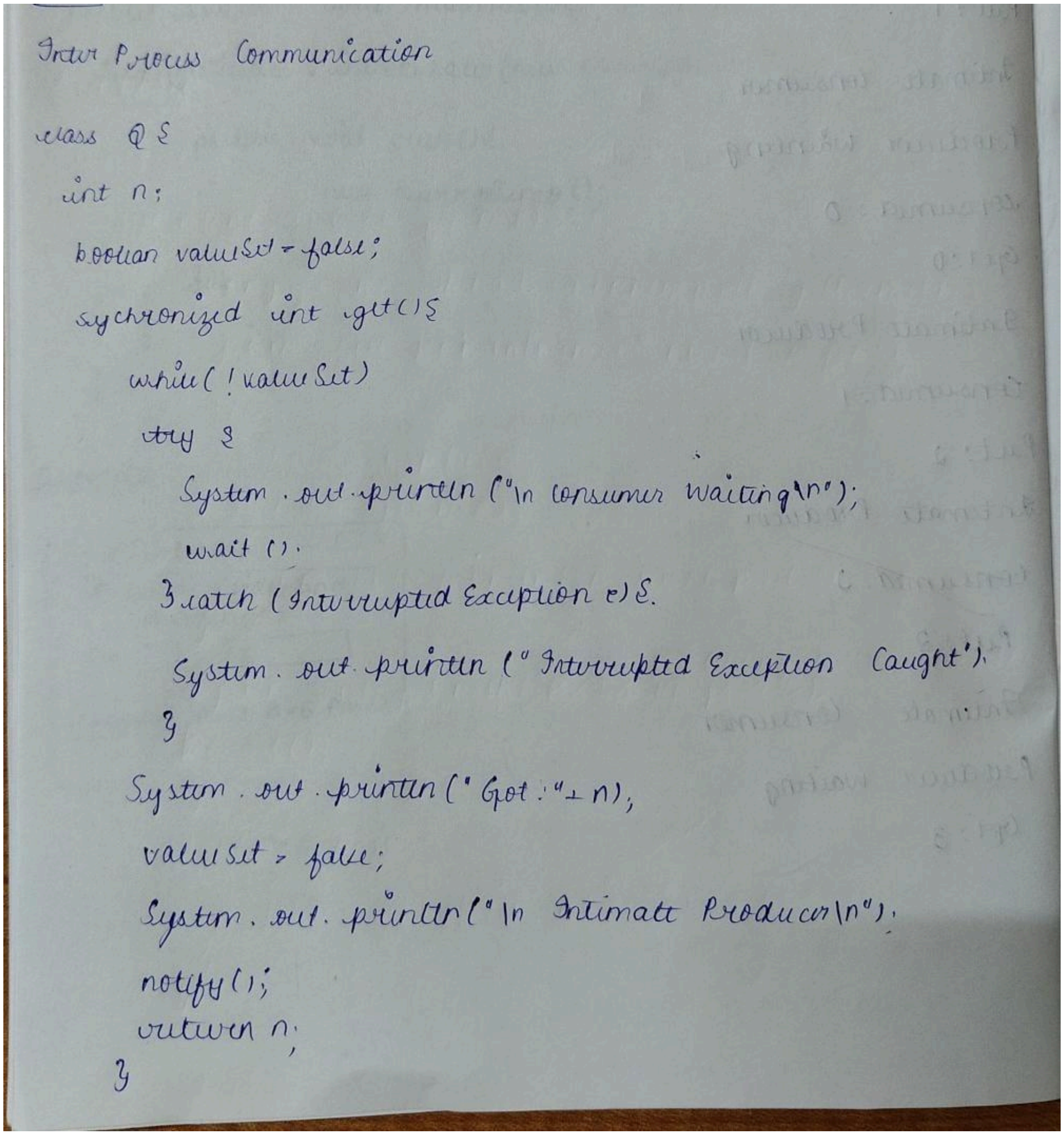


```
D:\Anu\Engineering\java>javac Division.java

D:\Anu\Engineering\java>java SwingDemo
Action event from a text field
Action event from a text field
```

Program 10

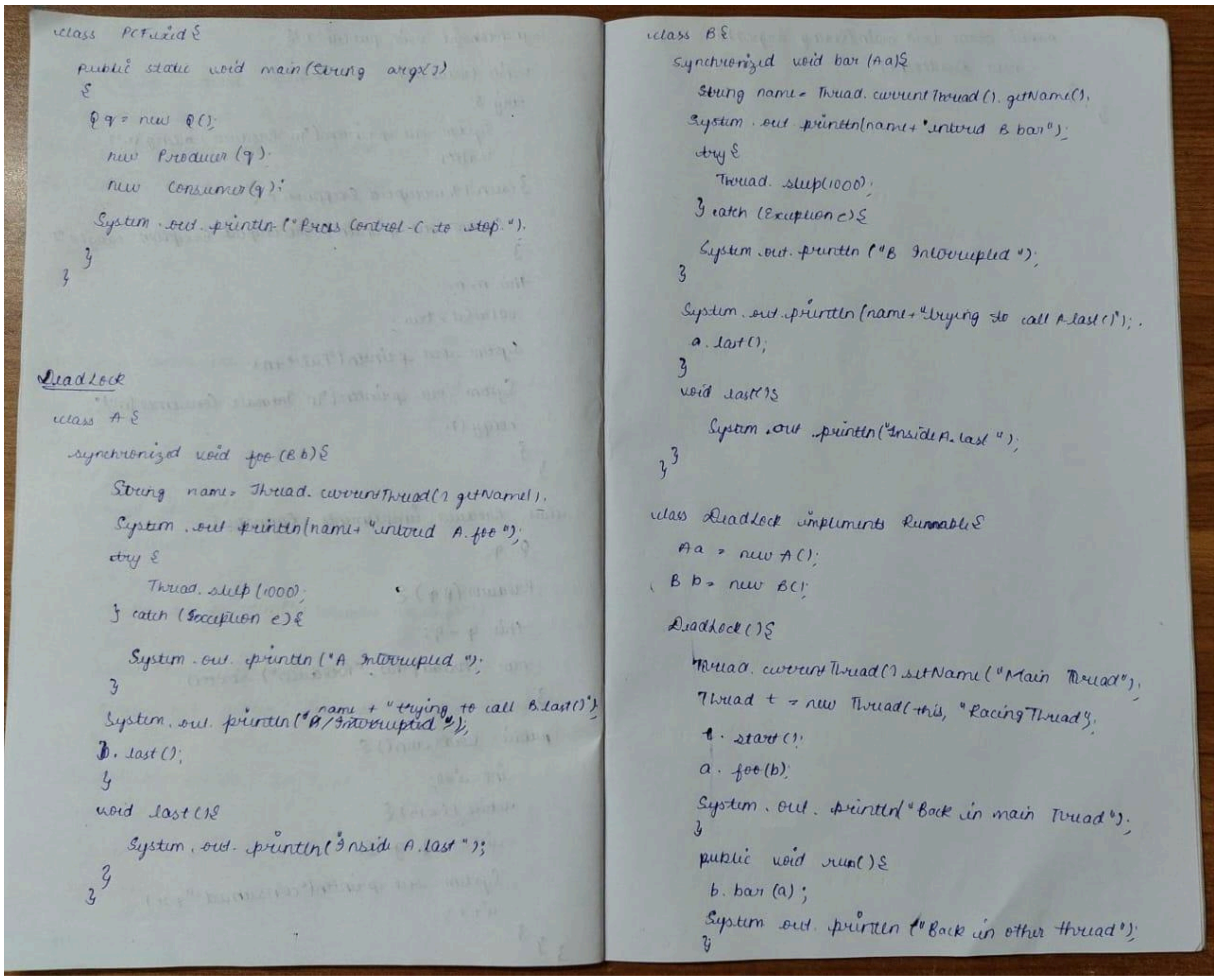
Demonstrate Inter process Communication and deadlock(Open Ended Exercise)

Algorithm:



Inter Process Communication

```
class Q {
  int n;
   boolean valueSet = false;
   sychronized int get() {
      while(!valueSet)
      try {
         System.out.println("\n consumer waiting\n");
         wait().
      }catch (InterruptedException e) {.
        System.out.println ("InterruptedException Caught").
      }
    System.out.println(" Got :"+n);
     valueSet = false;
     System.out.println("\n Intimate Producer\n").
     notify();
     return n;
  }
synchronized void put(int n){
 while (valueSet)
 try {
     System.out.println("\n Producer waiting \n");
     wait();
 }catch (InterruptedException e){
   System.out.println("InterruptedException caught");
  }
 this.n=n;
  valueSet = true;
  System.out.println("Put:"+n);
  System.out.println("\n Intimate 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){
      int r = q.get();
      System.out.println("consumed:"+r);
      i++;
} } }
```

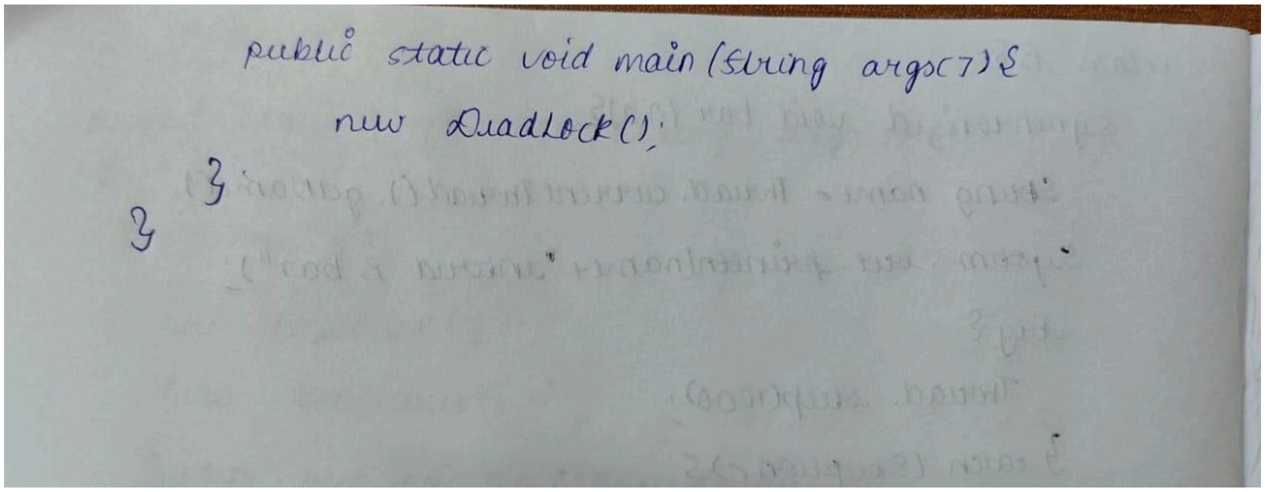


```
class PCFixed {
  public static void main(String args[])
  {
   Q q = new Q();
    new Producer(q).
    new Consumer(q);
   System.out.println("Press Control-C to stop.").
  }
}
```

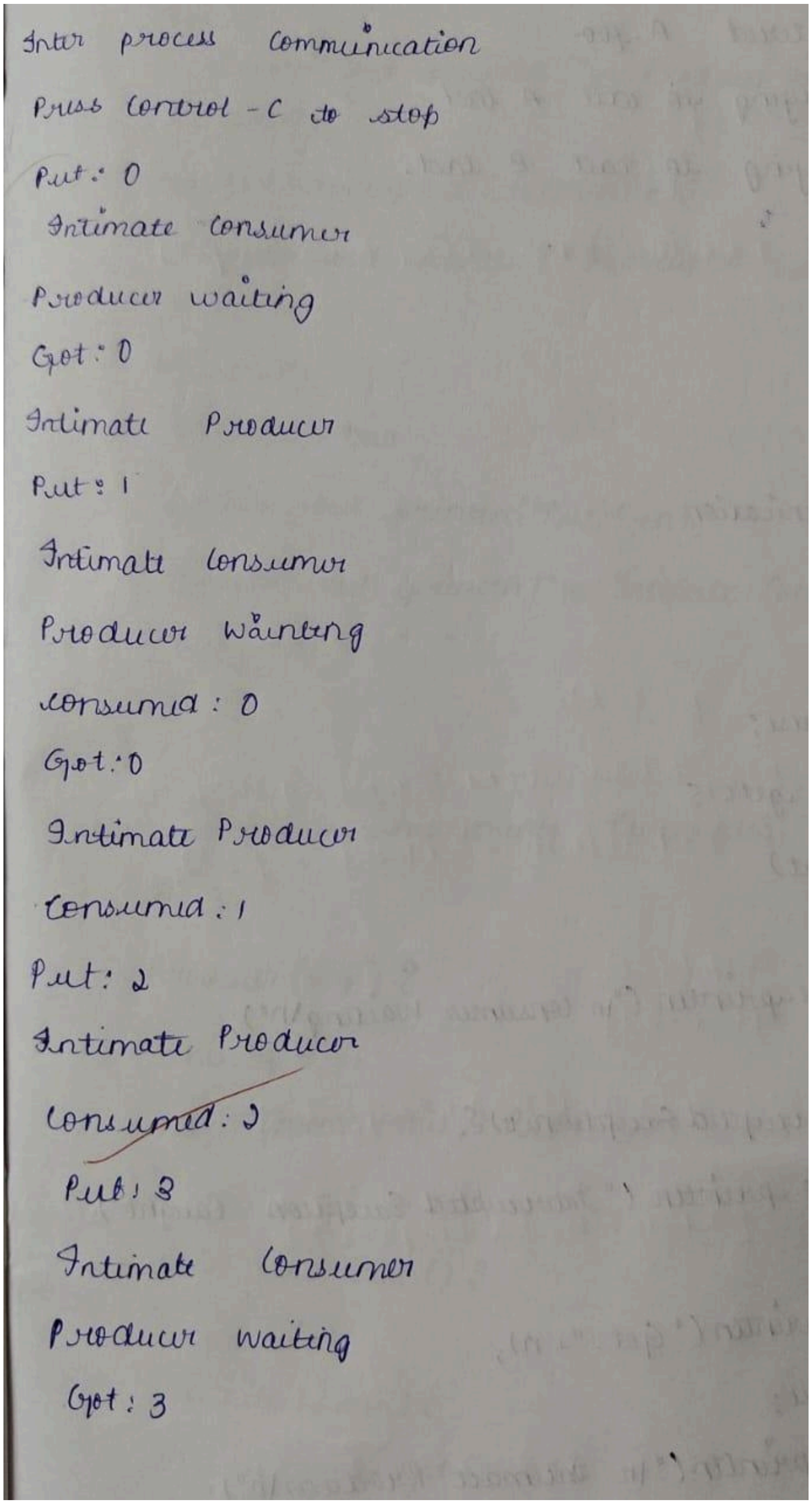
DeadLock

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

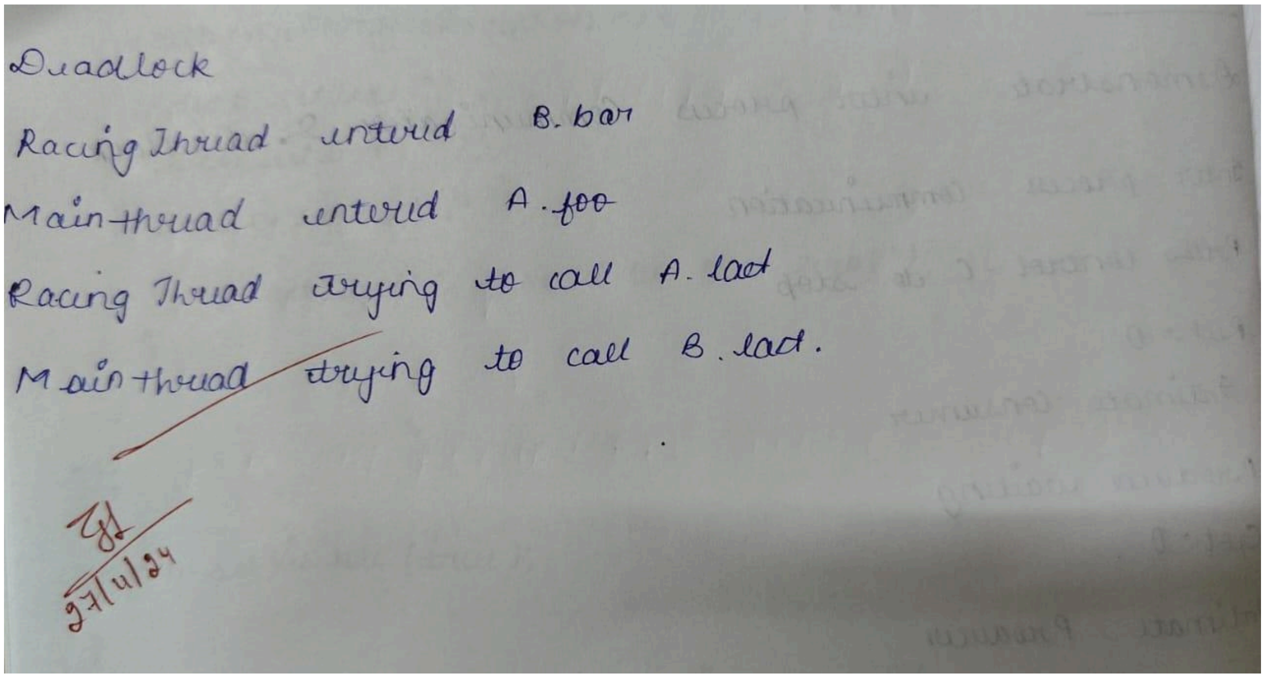
```
class B{
 synchronized void bar (A a){
   String name= Thread.currentThread().getName().
   System.out.println(name+"entered B bar");
   try {
     Thread.sleep(1000);
   } catch (Exception e){
    System.out.println("B Interrupted");
  }
  System.out.println(name+"trying to call A.last()");.
   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("Main Thread");
    Thread t = new Thread(this, "Racing Thread");
    t.start();
    a.foo(b);
   System.out.println("Back in main Thread");
   }
   public void run(){
    b.bar(a);
    System.out.println("Back in other thread");
   }
```



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



```
Inter process communication
Press control - C to stop
Put: 0
 Intimate consumer
Producer waiting
Got: 0
Intimate Producer
Put: 1
 Intimate consumer
 Producer wainting
 consumed : 0
 Got: 0
 Intimate Producer
 Consumed : 1
Put: 2
Intimate Producer
 Consumed: 2
  Put: 3
  Intimate  Consumer
  Producer  waiting
  Got: 3
```



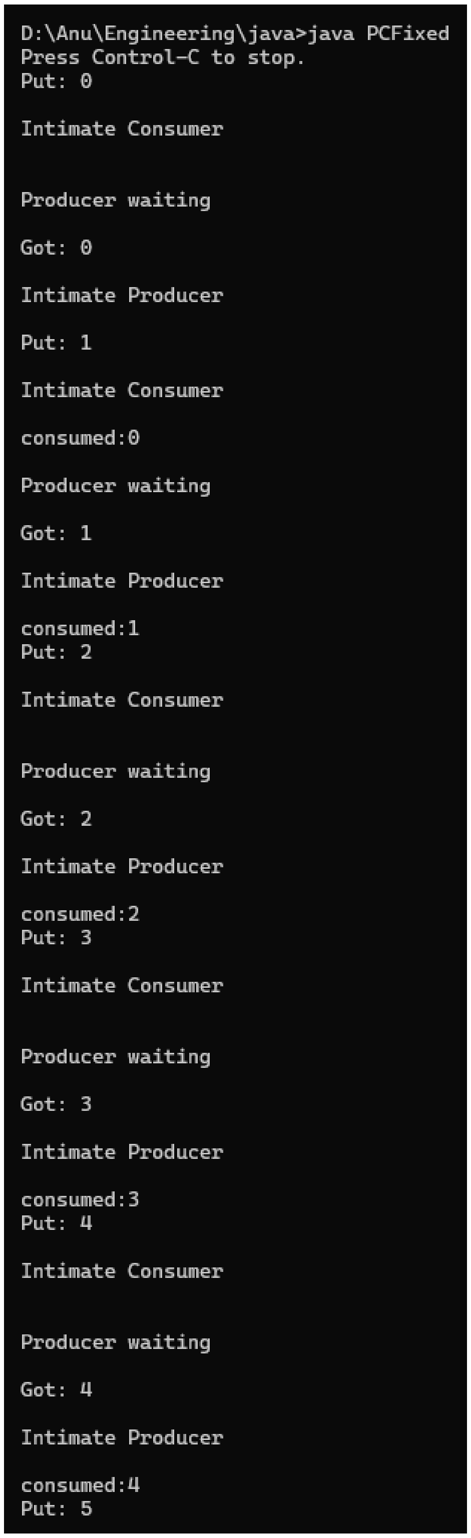
```
Deadlock
Racing Thread entered B.bar
Main thread entered A.foo
Racing Thread trying to call A.last
Main thread trying to call B.last.
```

[illegible]
27/11/24

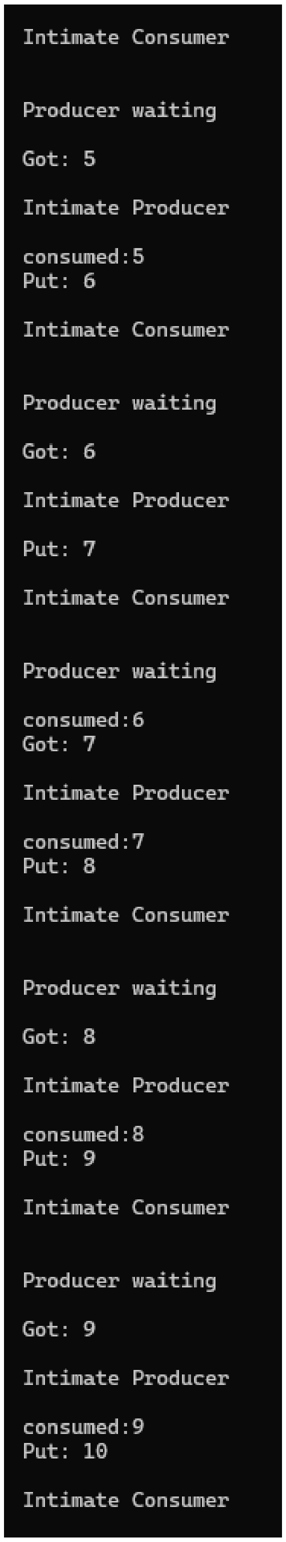
Code:
Inter process Communication

```
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("\nIntimate 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("\nIntimate 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.");
    }
}
```

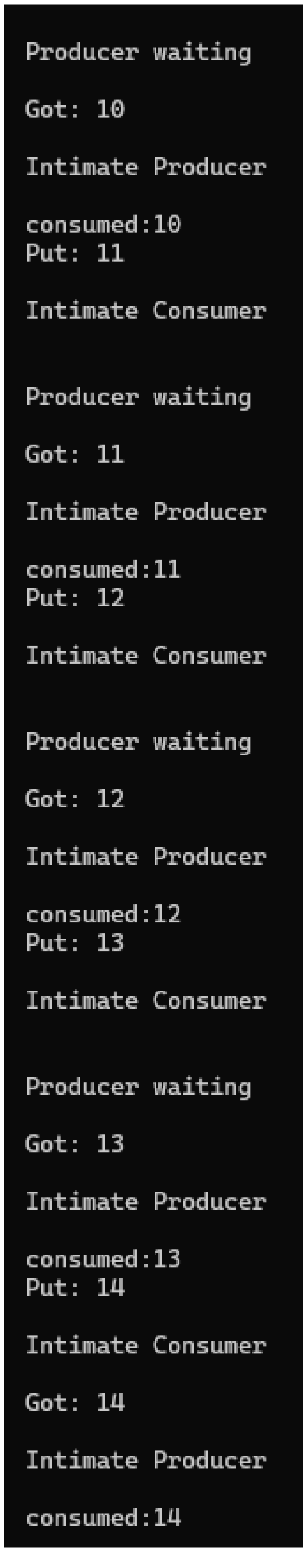
Output:



```
D:\Anu\Engineering\java>java PCFixed
Press Control-C to stop.
Put: 0

Intimate Consumer


Producer waiting

Got: 0

Intimate Producer

Put: 1

Intimate Consumer

consumed:0

Producer waiting

Got: 1

Intimate Producer

consumed:1
Put: 2

Intimate Consumer


Producer waiting

Got: 2

Intimate Producer

consumed:2
Put: 3

Intimate Consumer


Producer waiting

Got: 3

Intimate Producer

consumed:3
Put: 4

Intimate Consumer


Producer waiting

Got: 4

Intimate Producer

consumed:4
Put: 5
```



```
Intimate Consumer


Producer waiting

Got: 5

Intimate Producer

consumed:5
Put: 6

Intimate Consumer


Producer waiting

Got: 6

Intimate Producer

Put: 7

Intimate Consumer


Producer waiting

consumed:6
Got: 7

Intimate Producer

consumed:7
Put: 8

Intimate Consumer


Producer waiting

Got: 8

Intimate Producer

consumed:8
Put: 9

Intimate Consumer


Producer waiting

Got: 9

Intimate Producer

consumed:9
Put: 10

Intimate Consumer
```

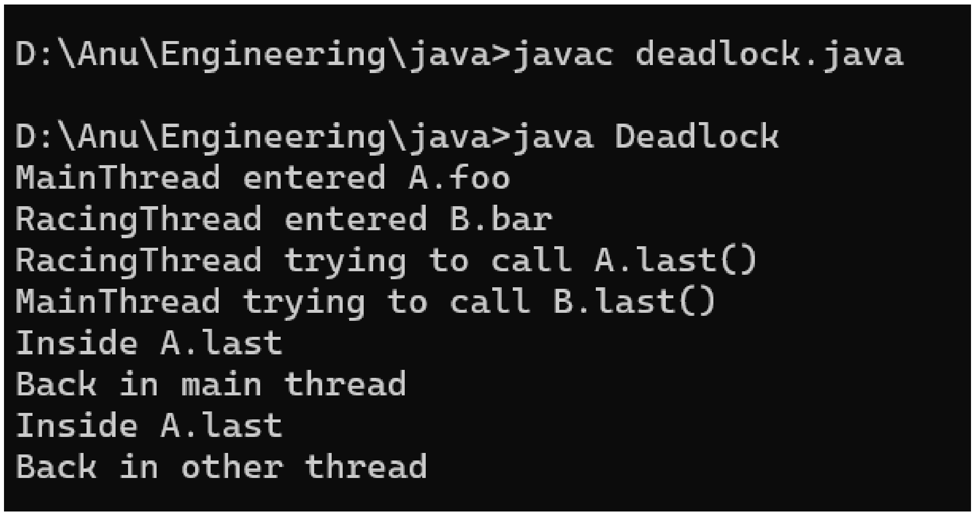


```
Producer waiting

Got: 10

Intimate Producer

consumed:10
Put: 11

Intimate Consumer


Producer waiting

Got: 11

Intimate Producer

consumed:11
Put: 12

Intimate Consumer


Producer waiting

Got: 12

Intimate Producer

consumed:12
Put: 13

Intimate Consumer


Producer waiting

Got: 13

Intimate Producer

consumed:13
Put: 14

Intimate Consumer

Got: 14

Intimate Producer

consumed:14
```

-Deadlock

```
class A {
   synchronized void foo(B b) {
         String name = Thread.currentThread().getName();
         System.out.println(name + " entered
            A.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:



```
D:\Anu\Engineering\java>javac deadlock.java

D:\Anu\Engineering\java>java Deadlock
MainThread entered A.foo
RacingThread entered B.bar
RacingThread trying to call A.last()
MainThread trying to call B.last()
Inside A.last
Back in main thread
Inside A.last
Back in other thread
```