VISVESVARAYA TECHNOLOGICAL UNIVERSITY

"JnanaSangama", Belgaum -590014, Karnataka.

LAB REPORT
on

Object Oriented Java Programming

(23CS3PCOOJ)

Submitted by

Annas Sharieff (1BM23CS041)

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,

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 **Annas Sharieff (1BM23CS041),** 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.

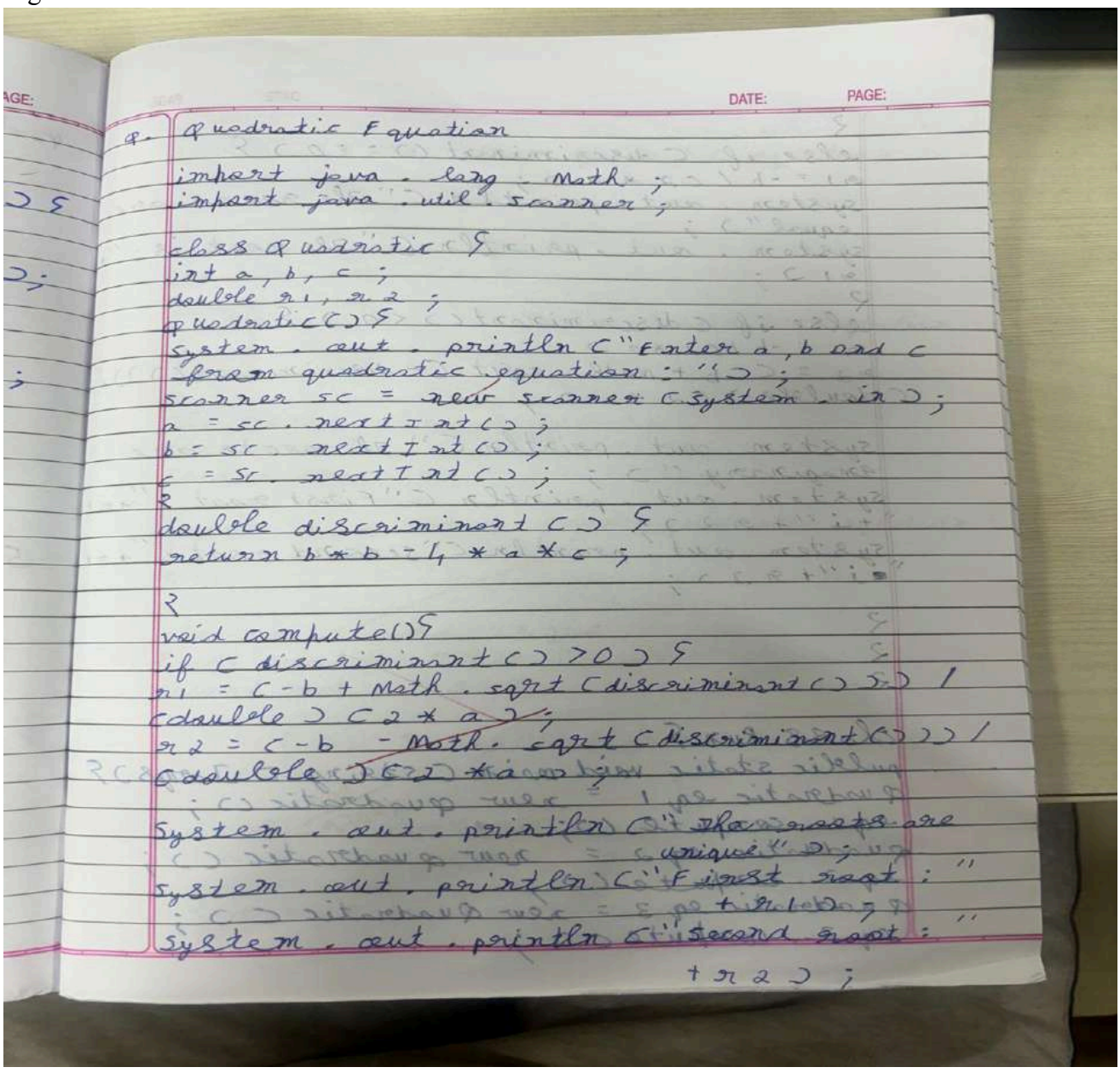
Dr. Sheeta VA Assistant Professor Department of CSE, BMSCE	Dr. Jyothi S Nayak Professor & HOD Department of CSE, BMSCE

Index

Github Link:
https://github.com/annas05shariff/java-lab

Program 1
Implement Quadratic Equation

Algorithm:



```
}
else if (discriminant() == 0) {
r1 = -b / (2 * a);
System.out.println("The roots are equal");
System.out.println("The root is: " + r1);
}
else if (discriminant() < 0) {
r1 = -b / (2 * a)
r2 = (-b + Math.sqrt(-discriminant())) / (double)(2 * a);

System.out.println("The roots are imaginary");
System.out.println("First root: " + r1 + " + i" + r2);
System.out.println("second root: " + r1 + " - i" + r2);

}
}
}

class Run {
public static void main(String[] args) {
Quadratic eq1 = new Quadratic();
eq1.compute();
Quadratic eq2 = new Quadratic();
eq2.compute();
Quadratic eq3 = new Quadratic();
eq3.compute();
```

DATE: PAGE:

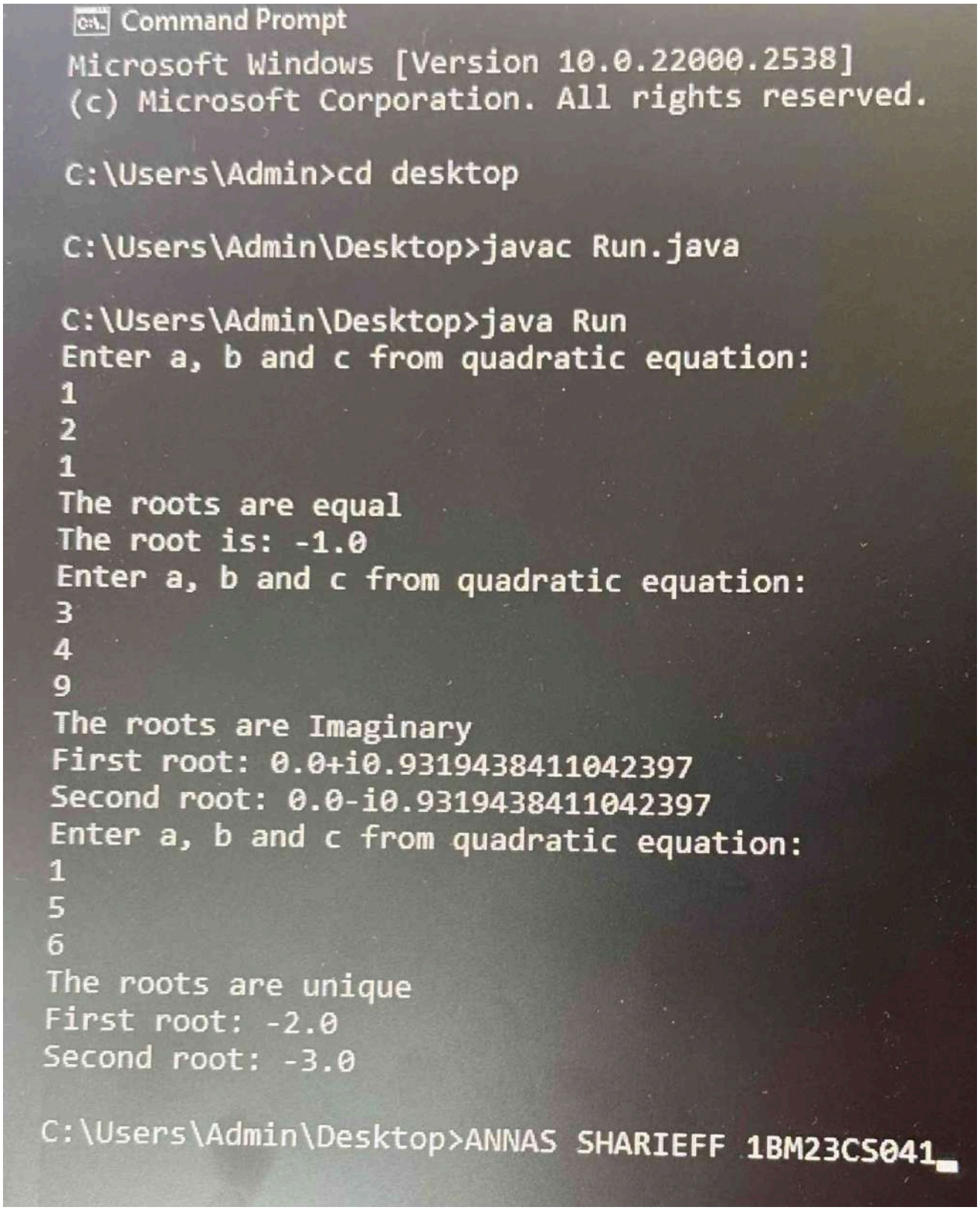
Output :

```
Enter a, b and c from quadratic equation :
1
2
1
The roots are equal
The root is : -1.0

Enter a, b and c from quadratic equation :
3
4
9
The roots are imaginary
First root : 0.0 + i 0.93194
Second root : 0.0 - i 0.93194

Enter a, b and c from quadratic equation :
1
5
6
The roots are unique
First root : -2.0
Second root : -3.0
```

7/2024

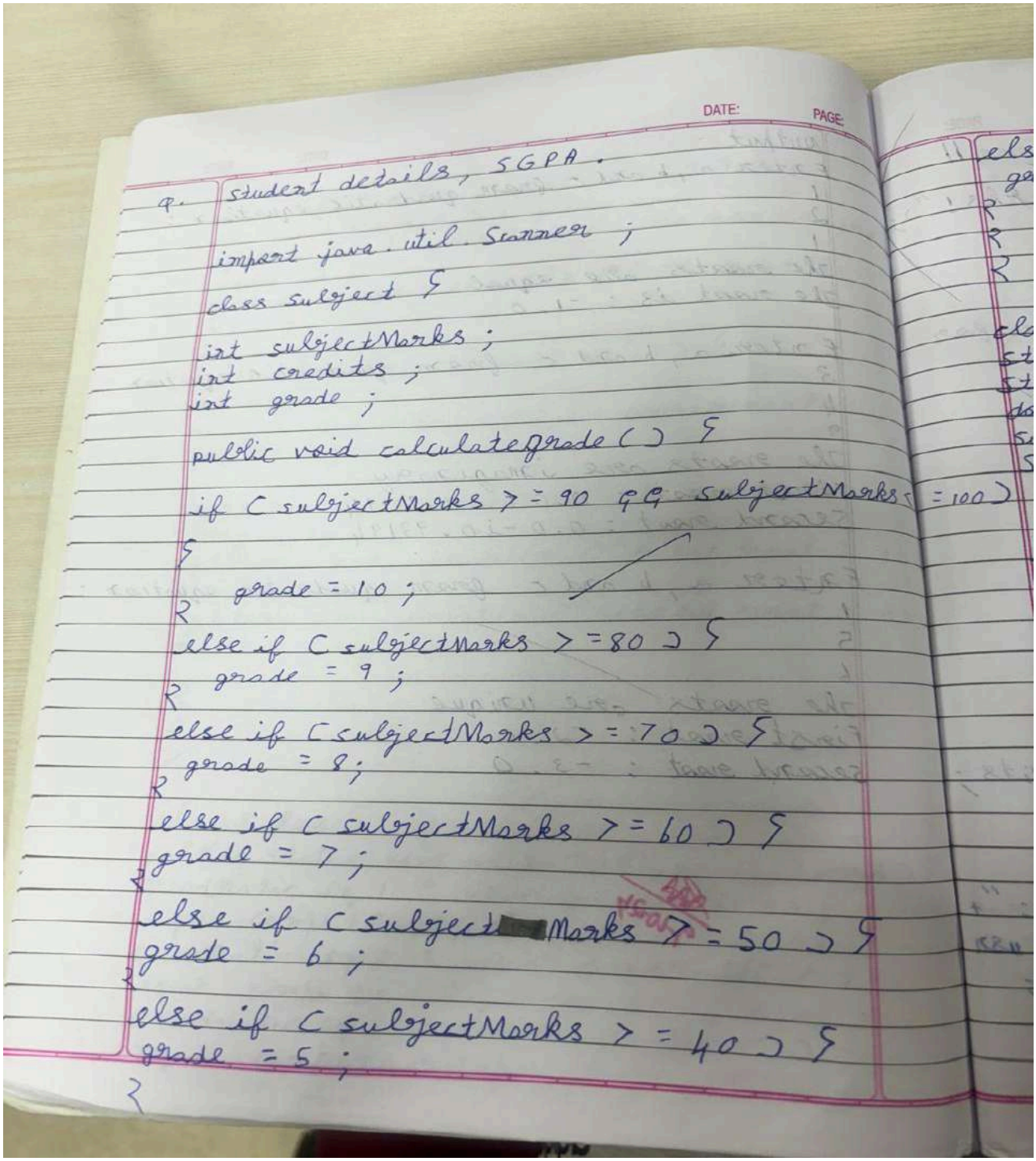
Code:

```
import java.lang.Math;
import java.util.Scanner;

class Quadratic{
int a, b, c;
double r1, r2;
Quadratic(){
System.out.println("Enter a, b and c from quadratic equation: ");
Scanner sc = new Scanner(System.in);
a = sc.nextInt();
b = sc.nextInt();
c = sc.nextInt();
}
double discriminant(){
return b*b-4*a*c;
}
void compute(){
if(discriminant() > 0){
r1 = (-b + Math.sqrt(discriminant()))/(double)(2*a);
r2 = (-b - Math.sqrt(discriminant()))/(double)(2*a);
System.out.println("The roots are unique");
System.out.println("First root: "+ r1);
System.out.println("Second root: "+ r2);
}
else if(discriminant() == 0){
r1 = -b/(2*a);
System.out.println("The roots are equal");
System.out.println("The root is: "+ r1);
}
else if(discriminant() < 0){
r1 = -b/(2*a);
r2 = (-b + Math.sqrt(-discriminant()))/(double)(2*a);
System.out.println("The roots are Imaginary");
System.out.println("First root: "+ r1 + "+i" + r2);
System.out.println("Second root: "+ r1 + "-i" + r2);

}
}
}


class Run{
public static void main(String[] args){
Quadratic eq1 = new Quadratic();
eq1.compute();
Quadratic eq2 = new Quadratic();
eq2.compute();
Quadratic eq3 = new Quadratic();
eq3.compute();
}
}
```


Command Prompt
Microsoft Windows [Version 10.0.22000.2538]
(c) Microsoft Corporation. All rights reserved.
C:\Users\Admin>cd desktop
C:\Users\Admin\Desktop>javac Run.java
C:\Users\Admin\Desktop>java Run
Enter a, b and c from quadratic equation:
1
2
1
The roots are equal
The root is: -1.0
Enter a, b and c from quadratic equation:
3
4
9
The roots are Imaginary
First root: 0.0+i0.9319438411042397
Second root: 0.0-i0.9319438411042397
Enter a, b and c from quadratic equation:
1
5
6
The roots are unique
First root: -2.0
Second root: -3.0
C:\Users\Admin\Desktop>ANNAS SHARIEFF 1BM23CS041

Program 2- SGPA Calculator :

Algorithm:



```
q. student details, SGPA.

import java.util.Scanner;
class subject {
int subjectMarks;
int credits;
int grade;
public void calculateGrade() {
if (subjectMarks >= 90 && subjectMarks <= 100)
{
   grade = 10;
}
else if (subjectMarks >= 80) {
   grade = 9;
}
else if (subjectMarks >= 70) {
   grade = 8;
}
else if (subjectMarks >= 60) {
grade = 7;
}
else if (subject[redacted]Marks >= 50) {
grade = 6;
}
else if (subjectMarks >= 40) {
grade = 5;
}
```

DATE: PAGE:

```
else {
  grade = 0;
}
}
}

class Student {
string name;
string usn;
double SGPA;
Subject[] subject = new Subject[8];
Scanner s = new Scanner(System.in);

public student() {
for(int i=0; i<8; i++) {
subject[i] = new subject();
}
}

public void getStudentDetails() {
System.out.println("Enter Student Name:");
name = s.nextline();
system.out.println("Enter student USN:");
usn = s.nextline();

public void getmarks() {
for(int i=0; i<8; i++) {
system.out.println("Enter Marks for
Subject" + (i+1) + ":");
subject[i].subjectmarks = s.nextint();
```

```
if (subject[i].subjectMarks > 100 ||
subject[i].subjectmarks < 0) {
system.out.println("Invalid marks!");
i--;
continue;
}
system.out.println("Enter Credits for
subject " + (i+1) + ":");
subject[i].credits = s.nextInt();
subject[i].calculategrade();
}
}

public void computeSGPA() {
 int totalcredits = 0;
int effectivescore = 0;
for (int i = 0; i < 8; i++) {
 effectivescore += (subject[i].grade *
subject[i].credits);
totalcredits += subject[i].credits;
}
SGPA = (double) effectivescore / totalcredits;
}

public void displayresult() {
system.out.println("\n Student Name: " + name);
system.out.println("\n Student USN: " + usn);
system.out.println("SGPA: " + SGPA);
}
}
```

```
public class Main {
public static void main (String [] args ) {
Student.getStudentdetails ();
Student.getmarks ();
Student.computeSGPA();
Student.displayresult ();
}
}
```

Output

```
Enter details for student:
Enter Student Name:
John Doe
Enter Student USN:
123
Enter Marks for Subject 1:
90
Enter Credits for Subject 1:
3
Enter Marks for subject 2:
70
Enter Marks credits for subject 2:
3
Enter marks for subject 3:
80
Enter credits for subject 3:
4
Enter Marks for subject 4:
90
Enter credits for subject 4:
4
```

DATE: PAGE:

Enter Marks for subject 5 :
60
Enter credits for subject 5 :
4
Enter Marks for subject 6 :
75
Enter credits for subject 6 :
2
Enter Marks for subject 7 :
90
Enter credits for subject 7 :
1
Enter Marks for subject 8 :
90
Enter credits for subject 8 :
1

Student Name : John Doe
student USN : 123
SGPA : 8.812

Code:

```
import java.util.Scanner;

class Subject {
    int subjectMarks;
    int credits;
    int grade;

    public void calculateGrade() {
        if (subjectMarks >= 90 && subjectMarks <= 100) {
            grade = 10;
        } else if (subjectMarks >= 80) {
            grade = 9;
        } else if (subjectMarks >= 70) {
            grade = 8;
        } else if (subjectMarks >= 60) {
            grade = 7;
        } else if (subjectMarks >= 50) {
            grade = 6;
        } else if (subjectMarks >= 40) {
            grade = 5;
        } else {
            grade = 0;
        }
    }
}

class Student {
    String name;
    String usn;
    double SGPA;
    Subject[] subject = new Subject[8];
    Scanner s = new Scanner(System.in);


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


    public void getStudentDetails() {
        System.out.println("Enter Student Name: ");
        name = s.nextLine();
        System.out.println("Enter Student USN: ");
        usn = s.nextLine();
    }
```

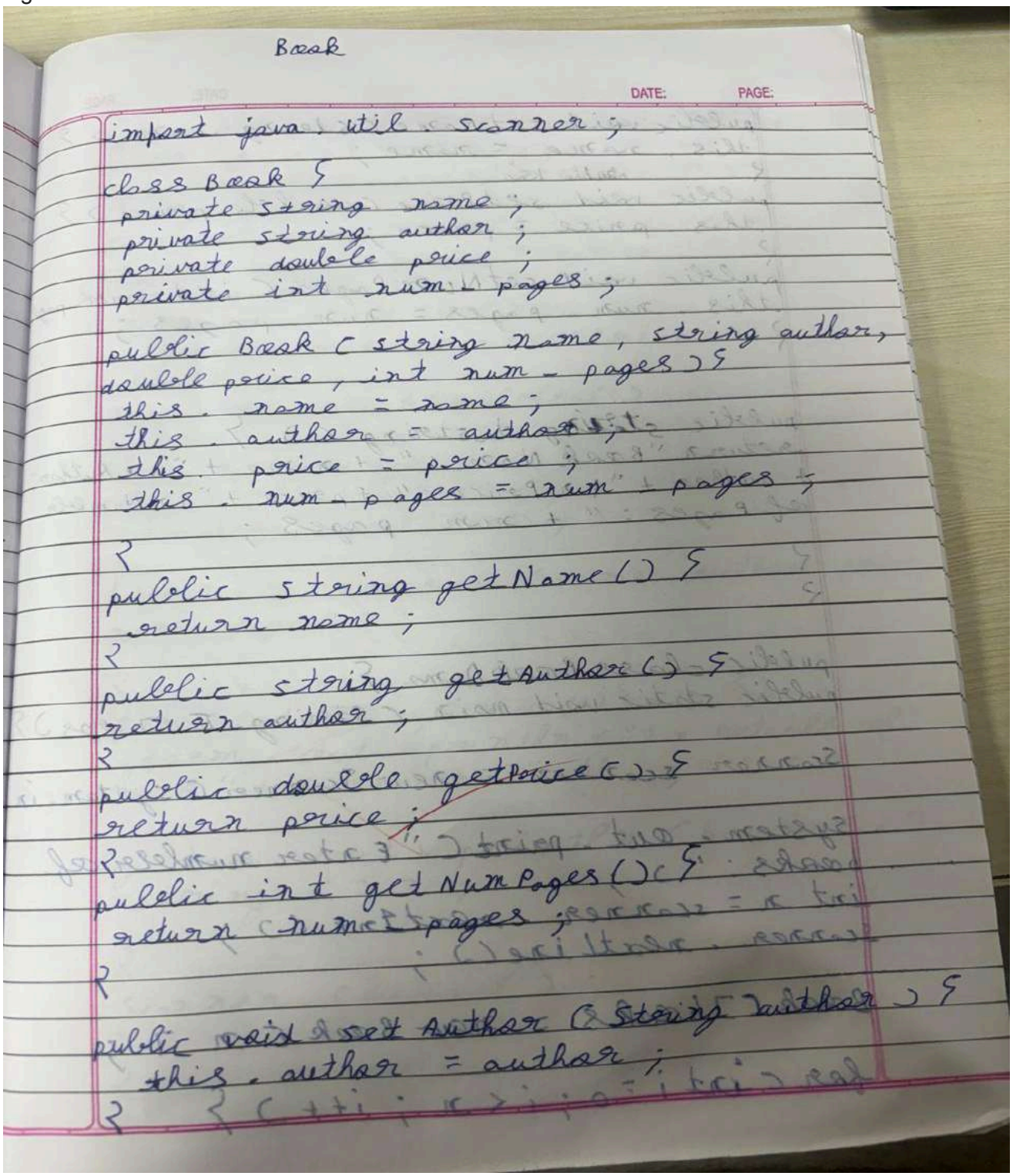
```
    public void getMarks() {
        for (int i = 0; i < 8; i++) {
            System.out.println("Enter Marks for Subject " + (i + 1) + ": ");
            subject[i].subjectMarks = s.nextInt();


            if (subject[i].subjectMarks > 100 || subject[i].subjectMarks < 0) {
                System.out.println("Invalid marks! Please enter again.");
                i--;
                continue;
            }

            System.out.println("Enter Credits for Subject " + (i + 1) + ": ");
            subject[i].credits = s.nextInt();

            subject[i].calculateGrade();
        }
    }


    public void computeSGPA() {
        int totalCredits = 0;
        int effectiveScore = 0;

        for (int i = 0; i < 8; i++) {
            effectiveScore += (subject[i].grade * subject[i].credits);
            totalCredits += subject[i].credits;
        }

        SGPA = (double) effectiveScore / totalCredits;
    }


    public void displayResult() {
        System.out.println("\nStudent Name: " + name);
        System.out.println("Student USN: " + usn);
        System.out.println("SGPA: " + SGPA);
    }
}

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


        Student[] students = new Student[3];


        for (int i = 0; i < 3; i++) {
            System.out.println("\nEnter details for Student " + (i + 1) + ": ");
            students[i] = new Student();
```

```
            students[i].getStudentDetails();
            students[i].getMarks();
            students[i].computeSGPA();
        }


        System.out.println("\n\nResults for all students:");
        for (int i = 0; i < 3; i++) {
            students[i].displayResult();
        }
    }
}
```

```
Enter details for Student 1:
Enter Student Name: John Doe
Enter Student USN: 1AB20CS101
Enter Marks for Subject 1: 85
Enter Credits for Subject 1: 4
...
Enter Marks for Subject 8: 70
Enter Credits for Subject 8: 3

Enter details for Student 2:
Enter Student Name: Jane Smith
Enter Student USN: 1AB20CS102
Enter Marks for Subject 1: 90
Enter Credits for Subject 1: 4
...

Enter details for Student 3:
Enter Student Name: Alex Johnson
Enter Student USN: 1AB20CS103
Enter Marks for Subject 1: 78
Enter Credits for Subject 1: 4
...

Results for all students:

Student Name: John Doe
Student USN: 1AB20CS101
SGPA: 8.25

Student Name: Jane Smith
Student USN: 1AB20CS102
SGPA: 9.15

Student Name: Alex Johnson
Student USN: 1AB20CS103
SGPA: 7.75
```

Program 3- Book Program:

Algorithm:



```
public void setName(String name){
this.name = name;
}
public void setPrice(double price){
this.price = price;
}
public void setNumPages(int num_pages){
this.num_pages = num_pages;
}

public String toString(){
return "Book Name: " + name + "\n Author
+ author + "\n Price: " + price + "\n Number
of Pages: " + num_pages;
}
}

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

Scanner scanner = new Scanner(System.in);

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

Book[] books = new Book[n];
for(int i=0; i<n; i++){
```

```
System.out.println("Enter details for
book " + (i+1) + ":");
System.out.print("Name: ");
String name =
scanner.nextLine();
System.out.print("Author: ");
String author =
scanner.nextLine();
System.out.print("Price: ");
double price =
scanner.nextDouble();
System.out.print("Number of Pages: ");
int num_pages =
scanner.nextInt();
scanner.nextLine();

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

}
for(int i=0; i<n; i++){
System.out.println("In details of
book " + (i+1) + ":");

System.out.println(books[i].
toString());

}
scanner.close();
}
}
```

DATE: PAGE:

output

```
Enter number of books : 2
Enter details for book 1 :
Name : wimpy kid
Author : ramanujan
Price : 200
Number of Pages : 250
Enter details for book 2 :
Name : rich dad poor dad
Author : ching chang
Price : 500
Number of pages : 300

Details of Book 1 :
Book Name : wimpy kid
Author : ramanujan
price : 200.0
Number of Pages : 250

Details of Book 2 :
Book Name : rich dad poor dad
Author : ching chang
Price : 500.0
Number of Pages: 300
```

Code:

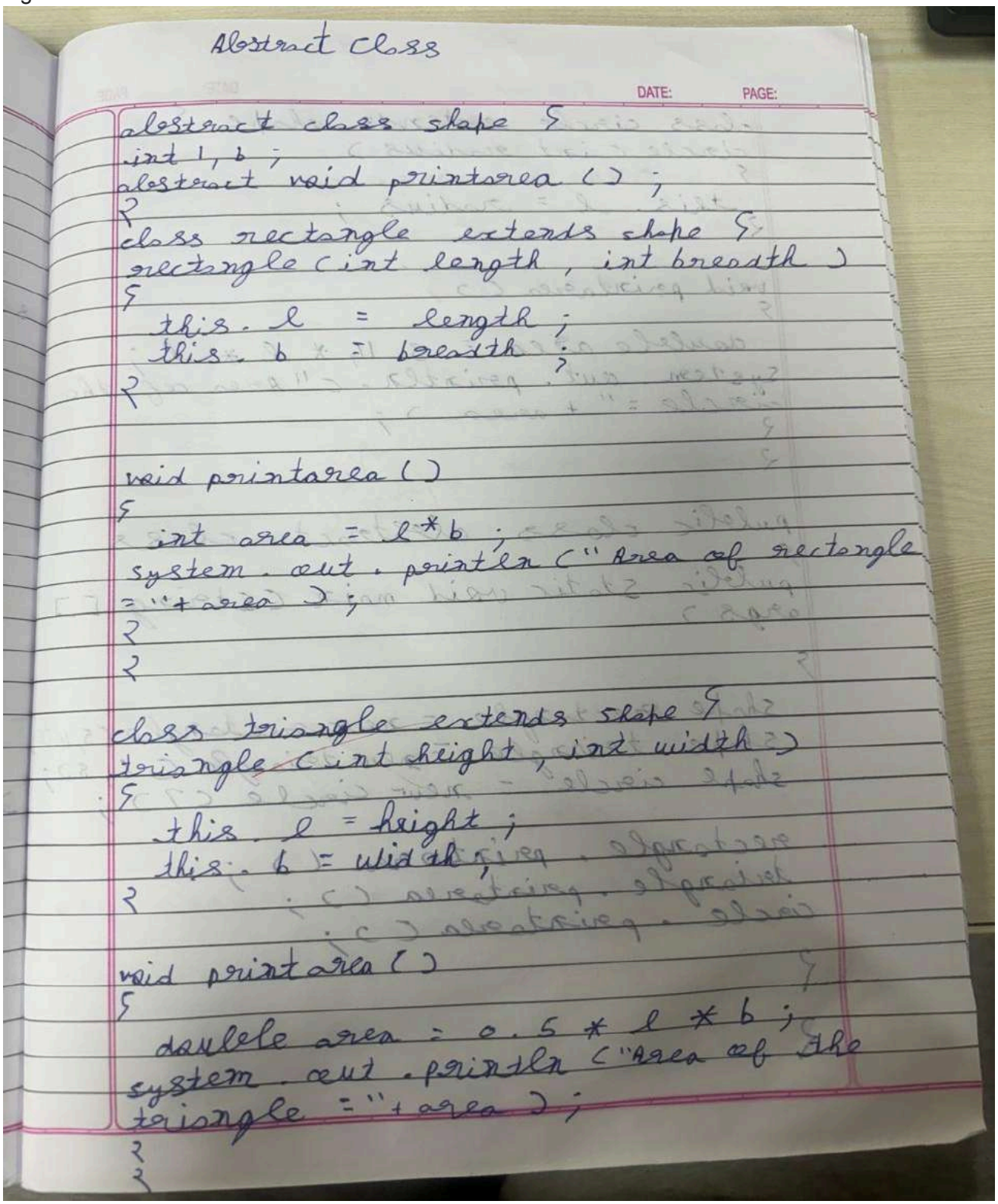
```
import java.util.Scanner;


class Book {

    String name;
    String author;
    int price;
    int numPages;


    Book(String name, String author, int price, int numPages) {
        this.name = name;
        this.author = author;
        this.price = price;
        this.numPages = numPages;
    }


    @Override
    public String toString() {
        String bookDetails = "Book name: " + this.name + "\n" +
                             "Author name: " + this.author + "\n" +
                             "Price: " + this.price + "\n" +
                             "Number of pages: " + this.numPages + "\n";
        return bookDetails;
    }
}


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

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


        Book[] books = new Book[n];


        for (int i = 0; i < n; i++) {

            System.out.print("Enter name of book " + (i + 1) + ": ");
            String name = s.next();
            System.out.print("Enter author of book " + (i + 1) + ": ");
            String author = s.next();
            System.out.print("Enter price of book " + (i + 1) + ": ");
            int price = s.nextInt();
            System.out.print("Enter number of pages in book " + (i + 1) + ": ");
```

```
            int numPages = s.nextInt();

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


        System.out.println("\nBook Details:");
        for (Book book : books) {
            System.out.println(book);
        }

        s.close();
    }
}
```

```
Microsoft Windows [Version 10.0.22000.2538]
(c) Microsoft Corporation. All rights reserved.

C:\Users\Admin>cd desktop

C:\Users\Admin\Desktop>javac BookDemo.java

C:\Users\Admin\Desktop>java BookDemo
Enter number of books: 2
Enter details for book 1:
Name: wimpy kid
Author: ramanujan
Price: 200
Number of Pages: 250
Enter details for book 2:
Name: rich dad poor dad
Author: ching chong
Price: 500
Number of Pages: 300

Details of Book 1:
Book Name: wimpy kid
Author: ramanujan
Price: 200.0
Number of Pages: 250

Details of Book 2:
Book Name: rich dad poor dad
Author: ching chong
Price: 500.0
Number of Pages: 300

C:\Users\Admin\Desktop>ANNAS SHARIEFF 041
```

Program 4- Abstract Class:

Algorithm:



```
class circle extends shape {
circle (int radius)
{
  this.l = radius;
}

void printarea ()
{
  double area = 3.14 * l * l;
System.out.println("Area of the
circle =" + area);
}
}

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

{
  shape rectangle = new rectangle (5,10);
  shape triangle = new triangle (6, 8);
  shape circle = new circle (7);

  rectangle.printarea ();
  triangle.printarea ();
  circle.printarea ();
}
```

Output

DATE: PAGE:

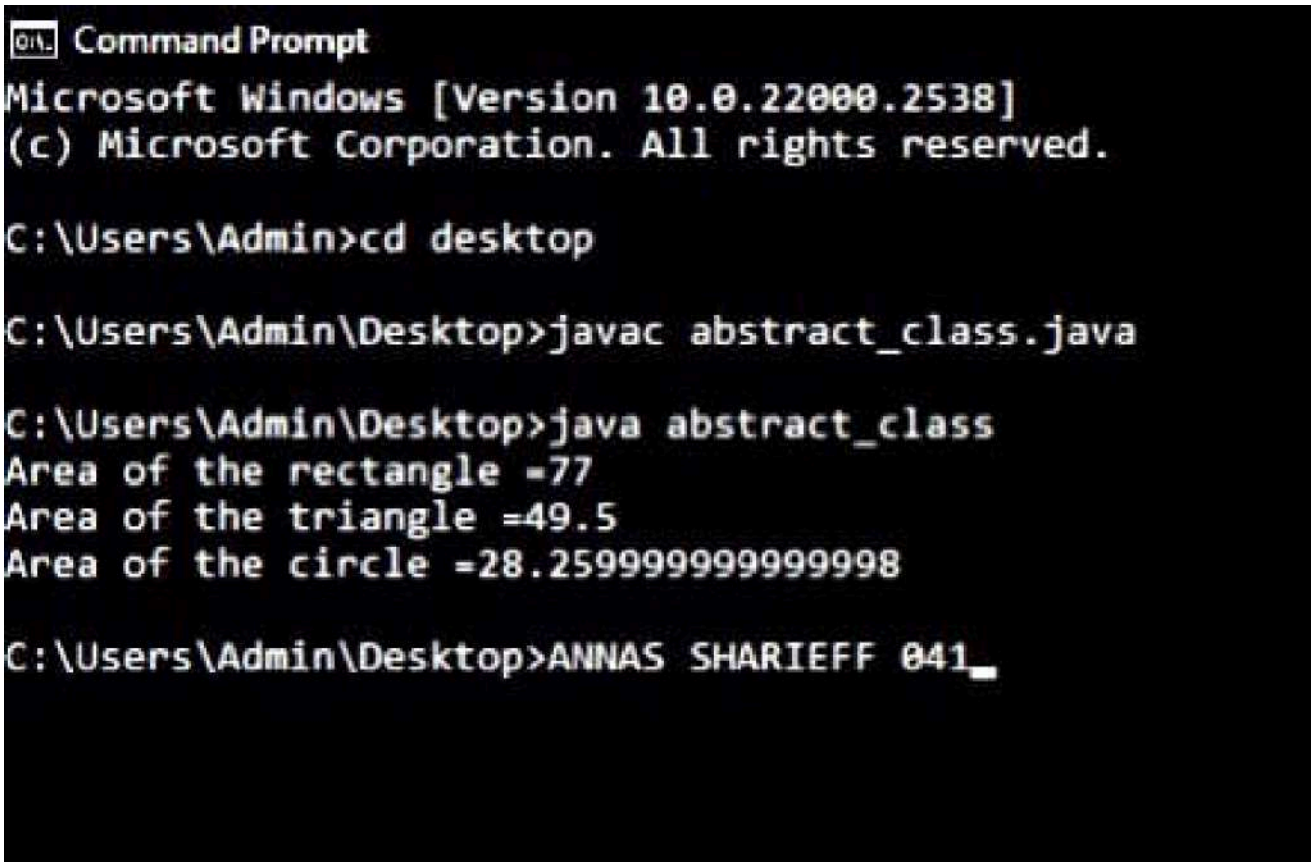
Area of the rectangle = 77
Area of triangle = 49.5
Area of the circle = 28.250

23/10/24

Code:

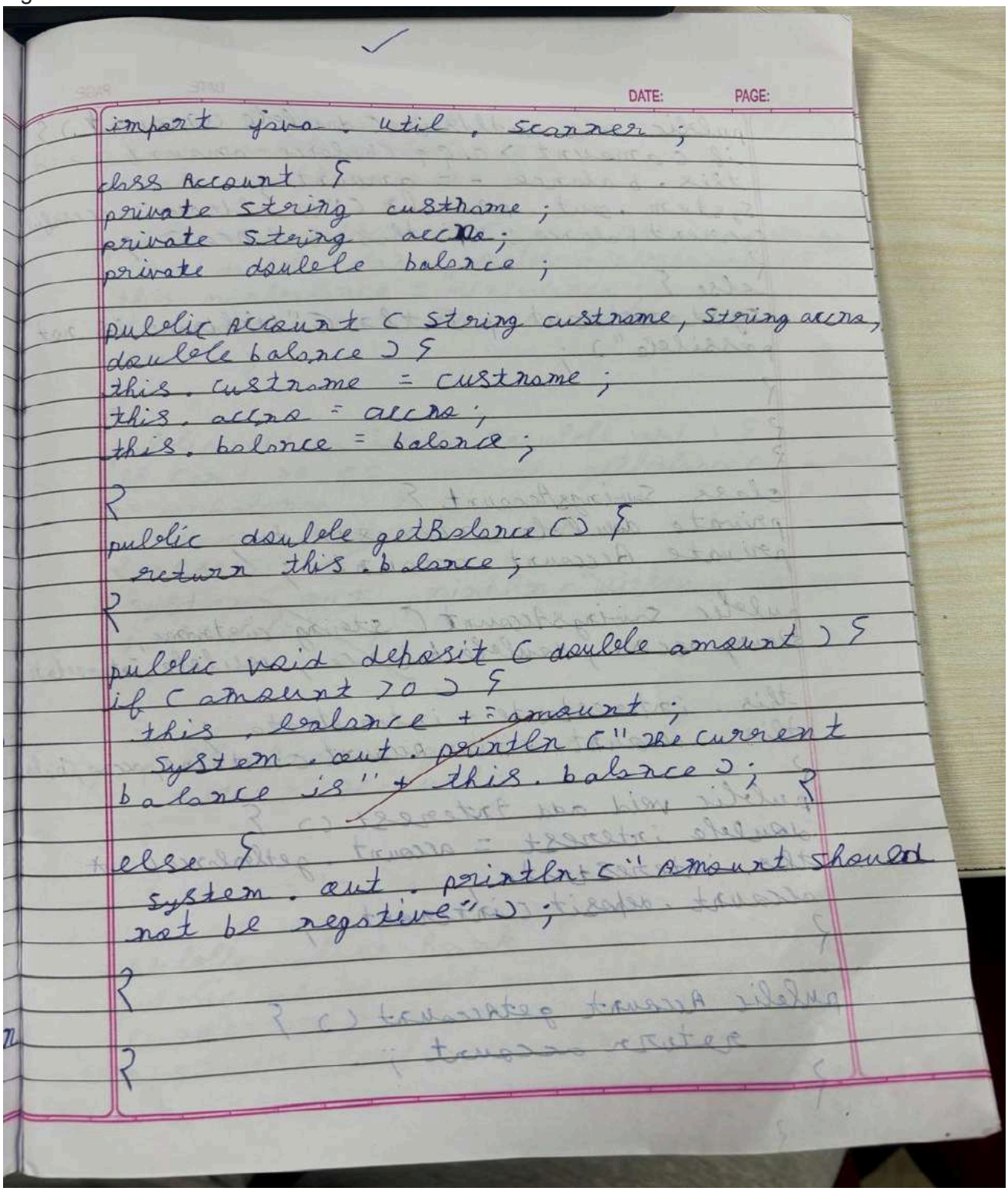
```
import java.util.Scanner;

abstract class Shape {
    int dim1;
    int dim2;


    public Shape() {
        this.dim1 = 0;
        this.dim2 = 0;

    }

    public Shape(int dim1, int dim2) {
        this.dim1 = dim1;
        this.dim2 = dim2;
    }

    public abstract void printArea();

}

class Rectangle extends Shape {
    public Rectangle(int length, int width) {
        dim1 = length;
        dim2 = width;
    }

    public void printArea() {

        int area = dim1 * dim2;
        System.out.println("Area of Rectangle: " + area);

    }
}

class Triangle extends Shape {
    public Triangle(int base, int height) {
        dim1 = base;
        dim2 = height;
    }

    public void printArea() {

        double area = 0.5 * dim1 * dim2;
        System.out.println("Area of Triangle: " + area);

    }
}
```

```
class Circle extends Shape {
    public Circle(int radius) {

        dim1 = radius;
        dim2 = 0;
    }

    public void printArea() {

        double area = Math.PI * dim1 * dim1;
        System.out.println("Area of Circle: " + area);
    }
}

public class shapes {

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

        System.out.println("Enter length and width for Rectangle:");

        int length = in.nextInt();
        int width = in.nextInt();
        Shape rectangle = new Rectangle(length, width);
        rectangle.printArea();

        System.out.println("Enter base and height for Triangle:");

        int base = in.nextInt();
        int height = in.nextInt();
        Shape triangle = new Triangle(base, height);
        triangle.printArea();

        System.out.println("Enter radius for Circle:");

        int radius = in.nextInt();
        Shape circle = new Circle(radius);
        circle.printArea();

        in.close();
    }
}
```


Command Prompt
Microsoft Windows [Version 10.0.22000.2538]
(c) Microsoft Corporation. All rights reserved.
C:\Users\Admin>cd desktop
C:\Users\Admin\Desktop>javac abstract_class.java
C:\Users\Admin\Desktop>java abstract_class
Area of the rectangle =77
Area of the triangle =49.5
Area of the circle =28.259999999999998
C:\Users\Admin\Desktop>ANNAS SHARIEFF 041

Program 5- Bank Program:

Algorithm:



```
import java.util.Scanner;

class Account {
private string custname;
private String accNo;
private double balance;

public Account ( String custname, String accNo,
double balance ) {
this.custname = custname;
this.accNo = accNo;
this.balance = balance;

}
public double getBalance() {
  return this.balance;
}

public void deposit (double amount) {
if (amount > 0) {
  this.balance += amount;
  System.out.println("The current
balance is" + this.balance); }

else {
  System.out.println("Amount should
not be negative");

}

}
```

```
public void withdraw (double amount) {
if (amount > 0 && (balance - amount >= 0
this.balance -= amount;
System.out.println ("withdraw successful
current balance: " + this.balance);
}
else {
system.out.println ("withdraw is not
possible");
}
}
}

class SavingsAccount {
private double interestrate;
private Account account;

public SavingsAccount (string custname,
string accno, double balance, double interest) {

this.interestrate = interestrate;
this.account = new Account (custname, accno, balance);
}
public void addInterest () {
double interest = account.getBalance() *
this.interestrate;
account.deposit (interest);
}

public Account getAccount () {
    return account;
}

}
```

DATE: PAGE:

```
class currentaccount {
private double minbalance;
private account account;

public currentAccount (string custname, string
accno, double balance, double minbalance) {
this.minbalance = minbalance;
this.account = new Account (custname, accno,
balance);
}
public void withdraw (double amt) {
if (amt > 0 && (account.getbalance() - amt)
>= minBalance) {
  account.withdraw (amt);
} else {
system.out.println ("withdraw is not
possible");
}
}
public Account getAccount () {
  return account;
}
}
public class Bank {
public static void main (String [] args) {
Scanner sc = new scanner (System.in);
system.out.println ("Enter the name:
);
```

```
string name = sc.nextline();
system.out.println("Enter the account
number:");
string accnt = sc.nextline();

while(true){
System.out.println("Enter your choice:");
System.out.println("1. Savings Account");
System.out.println("2. current Account");
System.out.println("3. Exit");
int choice = sc.nextint();

switch(choice){

case 1:
system.out.println("Enter initial balance:");
double savingsbalance = sc.nextdouble();
system.out.println("Enter interest rate:");
double interestrate = sc.nextdouble();
savingsaccount savingsaccount = new savingsaccount
(name, accnt, savingsbalance, interestrate);
savingsaccount.addinterest();
break;

case 2:
System.out.println("Enter Balance");
double currentbalance = sc.nextdouble();
System.out.println("Enter minimum
balance:");
double minbalance = sc.nextdouble();
currentaccount currentaccount = new currentacc
(name, accnt, currentbalance, minbalance);
```

```
System.out.println("enter the amount to
withdraw");

double q = sc.nextInt();
currentAccount.withdraw(q);
System.out.println("Account created.
current balance:" + currentAccount.get
Account().getBalance());
break;

case 3:

System.out.println("Exiting...");
sc.close();
return;

default:
System.out.println("invalid choice");

}
}
}
}
```

Output:

```
Enter the name:
anas
Enter the account number:
12345
Enter your choice:
1. Savings account
```

DATE: PAGE:

2. current Account
3. Exit

1
Enter initial balance :
54321
Enter interest rate :
9
The current balance is 5323530.0

Code:

```
import java.util.Scanner;

class Account {
    private String custName;
    private String accNo;
    private double balance;

    public Account(String custName, String accNo, double balance) {
        this.custName = custName;
        this.accNo = accNo;
        this.balance = balance;
    }

    public double getBalance() {
        return this.balance;
    }

    public void deposit(double amount) {
        if (amount > 0) {
            this.balance += amount;
            System.out.println("The current balance is " + this.balance);
        } else {
            System.out.println("Amount should not be negative");
        }
    }

    public void withdraw(double amount) {
        if (amount > 0 && (balance - amount) >= 0) {
            this.balance -= amount;
            System.out.println("Withdraw successful. Current balance: " + this.balance);
        } else {
            System.out.println("Withdraw is not possible");
        }
    }
}

class SavingsAccount {
    private double interestRate;
```

```
    private double interestRate;
    private Account account;

    public SavingsAccount(String custName, String accNo, double balance, double interestRate) {
        this.interestRate = interestRate;
        this.account = new Account(custName, accNo, balance);
    }

    public void addInterest() {
        double interest = account.getBalance() * this.interestRate;
        account.deposit(interest);
    }

    public Account getAccount() {
        return account;
    }
}

class CurrentAccount {
    private double minBalance;
    private Account account;

    public CurrentAccount(String custName, String accNo, double balance, double minBalance) {
        this.minBalance = minBalance;
        this.account = new Account(custName, accNo, balance);
    }

    public void withdraw(double amt) {
        if (amt > 0 && (account.getBalance() - amt) >= minBalance) {
            account.withdraw(amt);
        } else {
            System.out.println("Withdraw is not possible");
        }
    }

    public Account getAccount() {
        return account;
    }
}
```

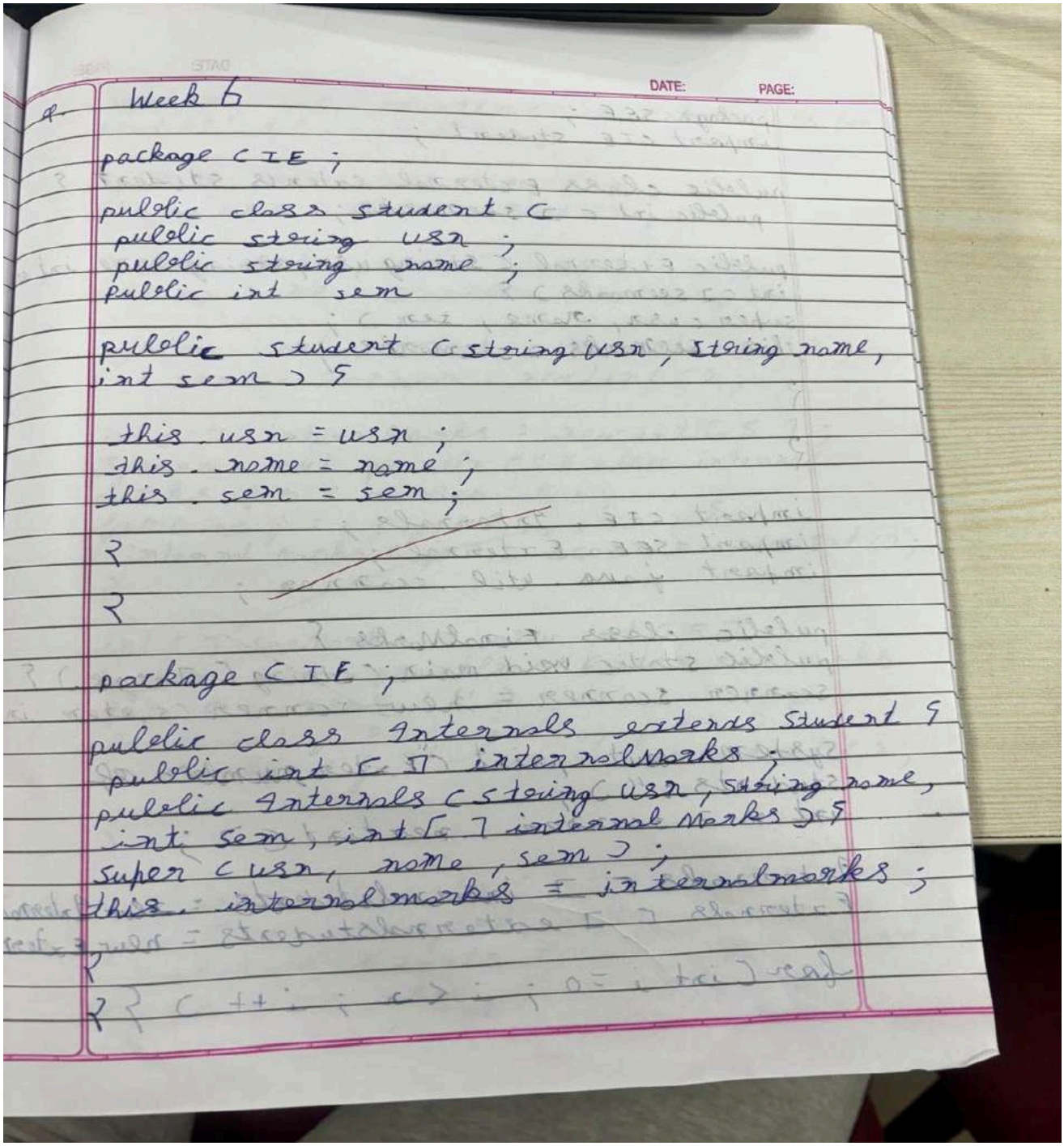
```
public class Bank {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.println("Enter the name:");
        String name = sc.nextLine();
        System.out.println("Enter the account number:");
        String accnt = sc.nextLine();

        while (true) {
            System.out.println("Enter your choice:");
            System.out.println("1. Savings Account");
            System.out.println("2. Current Account");
            System.out.println("3. Exit");
            int choice = sc.nextInt();

            switch (choice) {
                case 1:
                    System.out.println("Enter initial balance:");
                    double savingsBalance = sc.nextDouble();
                    System.out.println("Enter the interest rate:");
                    double interestRate = sc.nextDouble();
                    SavingsAccount savingsAccount = new SavingsAccount(name, accnt, savingsBalance, interestRate);
                    savingsAccount.addInterest();
                    break;

                case 2:
                    System.out.println("Enter initial balance:");
                    double currentBalance = sc.nextDouble();
                    System.out.println("Enter minimum balance:");
                    double minBalance = sc.nextDouble();
                    CurrentAccount currentAccount = new CurrentAccount(name, accnt, currentBalance, minBalance);

                    System.out.println("entr the amount to be withdraw");
                    double q = sc.nextInt();
                    currentAccount.withdraw(q);
                    System.out.println("Account created. Current balance: " + currentAccount.getAccount().getBalance());
                    break;

                case 3:
```

```
            System.out.println("1. Savings Account");
            System.out.println("2. Current Account");
            System.out.println("3. Exit");
            int choice = sc.nextInt();

            switch (choice) {
                case 1:
                    System.out.println("Enter initial balance:");
                    double savingsBalance = sc.nextDouble();
                    System.out.println("Enter the interest rate:");
                    double interestRate = sc.nextDouble();
                    SavingsAccount savingsAccount = new SavingsAccount(name, accnt, savingsBalance, interestRate);
                    savingsAccount.addInterest();
                    break;

                case 2:
                    System.out.println("Enter initial balance:");
                    double currentBalance = sc.nextDouble();
                    System.out.println("Enter minimum balance:");
                    double minBalance = sc.nextDouble();
                    CurrentAccount currentAccount = new CurrentAccount(name, accnt, currentBalance, minBalance);

                    System.out.println("entr the amount to be withdraw");
                    double q = sc.nextInt();
                    currentAccount.withdraw(q);
                    System.out.println("Account created. Current balance: " + currentAccount.getAccount().getBalance());
                    break;

                case 3:
                    System.out.println("Exiting...");
                    sc.close();
                    return;

                default:
                    System.out.println("Invalid choice. Please try again.");
            }
        }
    }
}
```

```
C:\Users\Admin\Desktop>javac Bank.java

C:\Users\Admin\Desktop>java Bank
Enter the name:
annas
Enter the account number:
12345
Enter your choice:
1. Savings Account
2. Current Account
3. Exit
1
Enter initial balance:
54321
Enter the interest rate:
7
The current balance is 434568.0
Enter your choice:
1. Savings Account
2. Current Account
3. Exit
annas sharieff 1bm23cs041
```

Program 6- Packages:

Algorithm:



```
package SEE;
import CIE.Student;

public class External extends Student {
    public int[] seemarks;

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

```
import CIE.Internals;
import SEE.External;
import java.util.Scanner;

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

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

        Internals[] internalStudents = new Internals[n];
        External[] externalStudents = new External[n];

        for (int i = 0; i < n; i++) {
```

```
System.out.println("\n Enter details for student " + (i+1) + ":");

System.out.print("USN: ");
String usn = scanner.next();

System.out.print("Name: ");
String name = scanner.next();

System.out.print("Semester: ");
int sem = scanner.nextInt();

int[] internalMarks = new int[5];
System.out.println("Enter internal marks for 5 courses:");
for(int j = 0; j < 5; j++) {
    internal marks[j] = scanner.nextInt();
}

int[] seeMarks = new int[5];
System.out.println("Enter SEE marks for 5 courses:");
for(int j = 0; j < 5; j++) {
    seeMarks[j] = scanner.nextInt();
}

    internalStudents[i] = new Internals
(usn, name, sem, internalmarks);
    externalStudents[i] = new External
(usn, name, sem, seeMarks);
```

```
System.out.println("\n Final Marks of Students");
for(int i=0 ; i<n ; i++){
system.out.println("student"+(i+1)+" USN: "+
internal students[i].usn);
for(int j=0 ; j<5 ; j++){
int finalMark = (internalStudents[i].internalMarks[j]
+ (external students[i].seeMarks[j])/2);
System.out.println("Course"+(j+1)+
"Final mark:"+finalmark);
}
}
scanner.close();
}
}
```

output :

Enter details for student 1 :
USN : 1bm23cs041
Name : Annas
Semester : 3
Enter internal marks for 5 courses :
50
40
32

DATE: PAGE:

36
40

Enter SEE marks for 5 courses :
71
72
73
74
75

Final marks of Students :

Student 7 - USN : 1bm23cs041
Course 1 final Mark : 66
Course 2 final Mark : 68
Course 3 final Mark : 69
Course 4 final Mark : 71
Course 5 final Mark : 72

Code:

```
package CIE;

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

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

public class Internals extends Student {
    public int[] internalMarks;

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

public class External extends Student {
    public int[] seeMarks;

    public External(String usn, String name, int sem, int[] seeMarks) {
        super(usn, name, sem);
        this.seeMarks = seeMarks;
    }
}
import CIE.Internals;
import SEE.External;
import java.util.Scanner;
```

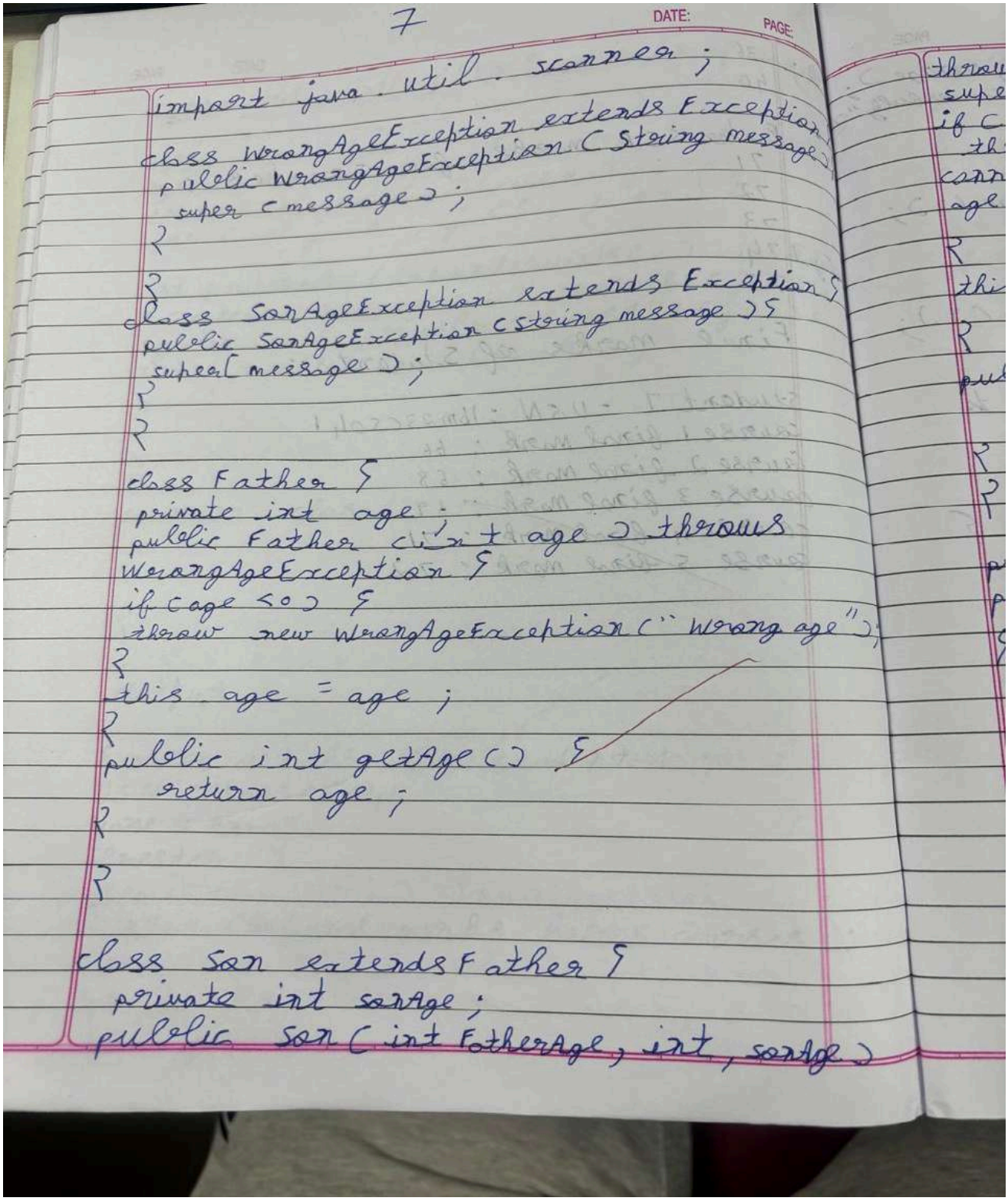
```
public class FinalMarks {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);

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

        Internals[] internalStudents = new Internals[n];
        External[] externalStudents = new External[n];


        for (int i = 0; i < n; i++) {
            System.out.println("\nEnter details for student " + (i + 1) + ":");

            System.out.print("USN: ");
            String usn = scanner.next();

            System.out.print("Name: ");
            String name = scanner.next();

            System.out.print("Semester: ");
            int sem = scanner.nextInt();

            int[] internalMarks = new int[5];
            System.out.println("Enter internal marks for 5 courses:");
            for (int j = 0; j < 5; j++) {
                internalMarks[j] = scanner.nextInt();
            }

            int[] seeMarks = new int[5];
            System.out.println("Enter SEE marks for 5 courses:");
            for (int j = 0; j < 5; j++) {
                seeMarks[j] = scanner.nextInt();
            }

            internalStudents[i] = new Internals(usn, name, sem, internalMarks);
            externalStudents[i] = new External(usn, name, sem, seeMarks);
        }
```

```
            System.out.print("USN: ");
            String usn = scanner.next();

            System.out.print("Name: ");
            String name = scanner.next();

            System.out.print("Semester: ");
            int sem = scanner.nextInt();

            int[] internalMarks = new int[5];
            System.out.println("Enter internal marks for 5 courses:");
            for (int j = 0; j < 5; j++) {
                internalMarks[j] = scanner.nextInt();
            }

            int[] seeMarks = new int[5];
            System.out.println("Enter SEE marks for 5 courses:");
            for (int j = 0; j < 5; j++) {
                seeMarks[j] = scanner.nextInt();
            }

            internalStudents[i] = new Internals(usn, name, sem, internalMarks);
            externalStudents[i] = new External(usn, name, sem, seeMarks);
        }


        System.out.println("\nFinal Marks of Students:");
        for (int i = 0; i < n; i++) {
            System.out.println("\nStudent " + (i + 1) + " - USN: " + internalStudents[i].usn);
            for (int j = 0; j < 5; j++) {
                int finalMark = (internalStudents[i].internalMarks[j] + (externalStudents[i].seeMarks[j]) / 2);
                System.out.println("Course " + (j + 1) + " Final Mark: " + finalMark);
            }
        }

        scanner.close();
    }
}
```

```
Enter details for student 1:
USN: 1bm23cs041
Name: annas
Semester: 3
Enter internal marks for 5 courses:
31
32
33
34
35
Enter SEE marks for 5 courses:
71
72
73
74
75

Final Marks of Students:

Student 1 - USN: 1bm23cs041
Course 1 Final Mark: 66
Course 2 Final Mark: 68
Course 3 Final Mark: 69
Course 4 Final Mark: 71
Course 5 Final Mark: 72
```

Program 7- Exception Handling:

Algorithm:



```
throws WrongAgeException, SonAgeException {
super (fatherAge);
if (sonAge >= fatherAge) {
  throw new SonAgeException("Son's age
cannot be greater than or equal to father's
age");
}
this.sonAge = sonAge;
}
public int getSonAge() {
  return sonAge;
}
}

public class FatherSon {
public static void main (String[] args)
{
while (true) {
scanner sc = new scanner (System.in);
System.out.print("Enter Father's Age:");

int fatherAge = sc.nextint();

System.out.println("Enter Son's Age:");
int sonAge = sc.nextInt();

try {
```

```
Son son = new Son (fatherAge, sonAge);
System.out.println("accepted successfully");
}
catch (WrongAgeException e) {
    System.out.println(e.getMessage());
}
catch (SonAgeException e) {
    System.out.println(e.getMessage());
}
System.out.println("Would you like to
re-enter details (Y/n)");
String input = sc.next();

if (input.equalsIgnoreCase("n")) {
    break;
}
}
```

output :

Enter Father's Age : 18
Enter Son's Age : 3
Accepted Succesfully

DATE: PAGE:

Would you like to reenter details (Y/n)
y

Enter Father's Age : 3
Enter Son's Age : 15

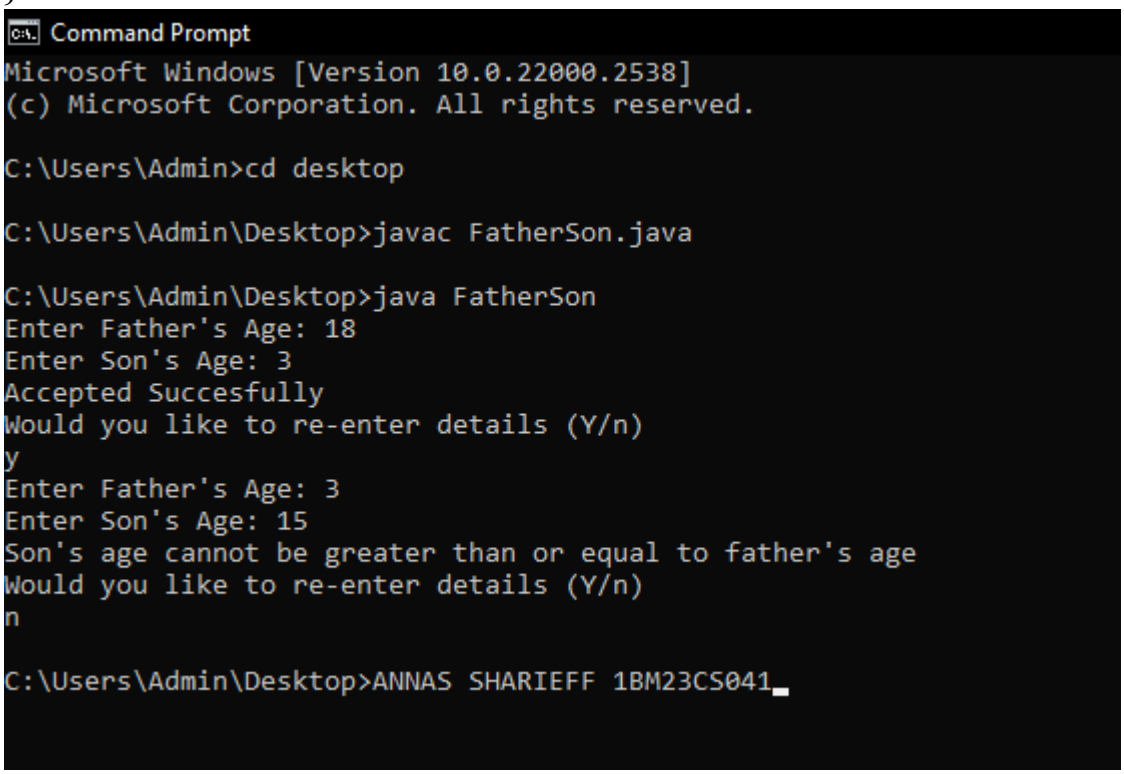
Son's age cannot be greater or equal to father's Age.

Code:

```
import java.util.Scanner;
class WrongAgeException extends Exception {
    public WrongAgeException(String message) {
        super(message);
    }
}

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

class Father {
    private int age;
    public Father(int age) throws WrongAgeException {
        if (age < 0) {
            throw new WrongAgeException("Wrong age");
        }
        this.age = age;
    }
    public int getAge() {
        return age;
    }
}

class Son extends Father {
    private int sonAge;
    public Son(int fatherAge, int sonAge) throws
WrongAgeException, SonAgeException {
```

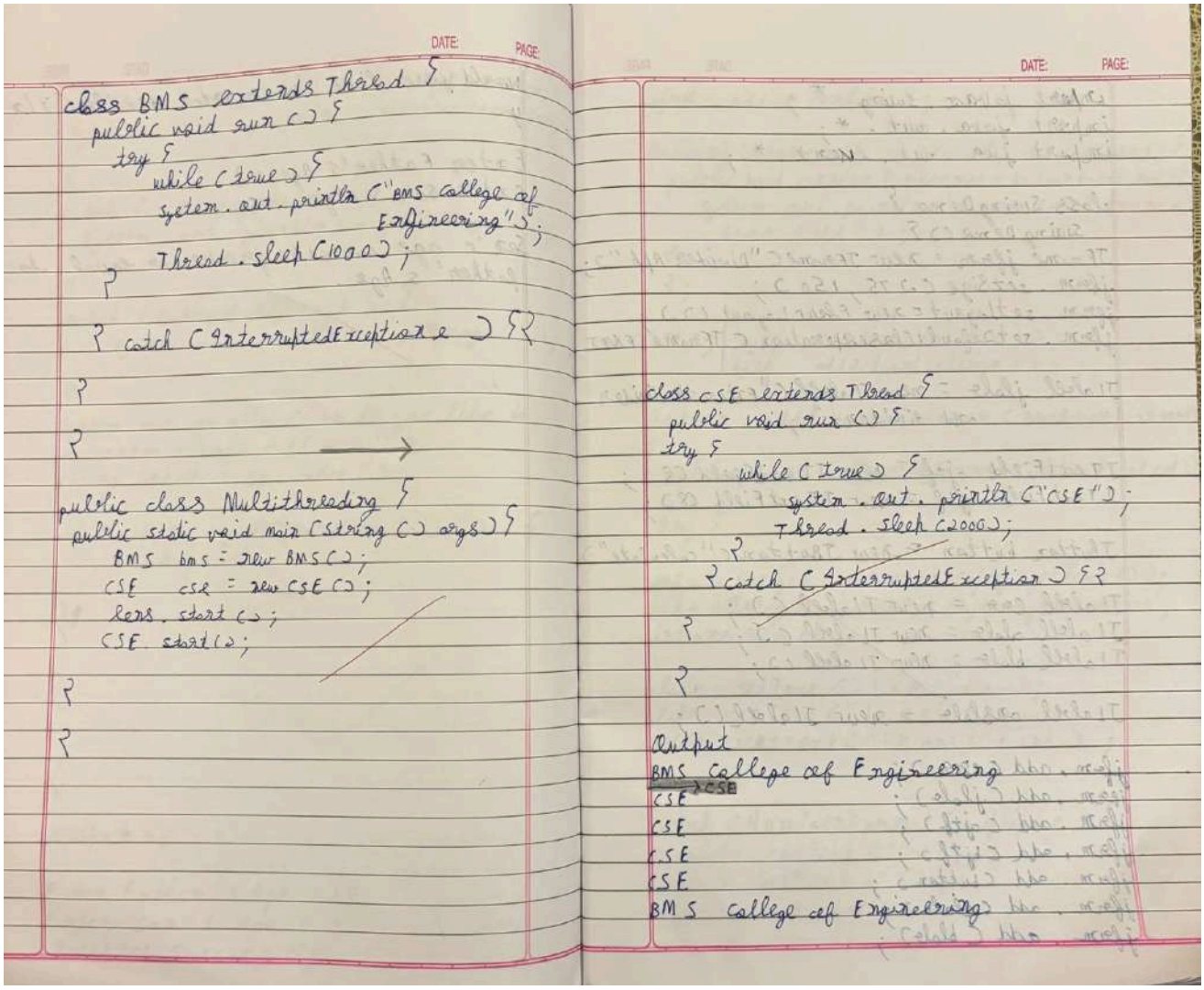
```
        super(fatherAge);
        if (sonAge >= fatherAge) {
            throw new SonAgeException("Son's age cannot be greater
than or equal to father's age");
        }
        this.sonAge = sonAge;
    }
    public int getSonAge() {
        return sonAge;
    }
}
public class FatherSon{
    public static void main(String[] args) {
        while(true){
            Scanner sc = new Scanner(System.in);
            System.out.print("Enter Father's Age: ");
            int fatherAge = sc.nextInt();
            System.out.print("Enter Son's Age: ");
            int sonAge = sc.nextInt();
            try {
                Son son = new Son(fatherAge, sonAge);
                System.out.println("Accepted Succesfully");
            }
            catch (WrongAgeException e) {
                System.out.println(e.getMessage());
            }
            catch (SonAgeException e) {
                System.out.println(e.getMessage());
            }
            System.out.println("Would you like to re-enter details
(Y/n)");
```

```
            String input = sc.next();
            if (input.equalsIgnoreCase("n")) {
                break;
            }
        }
    }
}
```



Program 8- Multithreading:

Algorithm:



```
class BMS extends Thread {
public void run () {
try {
while (true) {
system.out.println("BMS college of
                    Engineering");
Thread.sleep (1000);
}
} catch (InterruptedException e) {}
}

public class Multithreading {
public static void main (String [] args) {
BMS bms = new BMS ();
CSE cse = new CSE ();
bms.start ();
CSE.start ();
}
}

class CSE extends Thread {
public void run () {
try {
while (true) {
system.out.println ("CSE");
Thread.sleep (2000);
}
} catch (InterruptedException) {}
}
}
```

Output

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

Code:

Multithreading.java

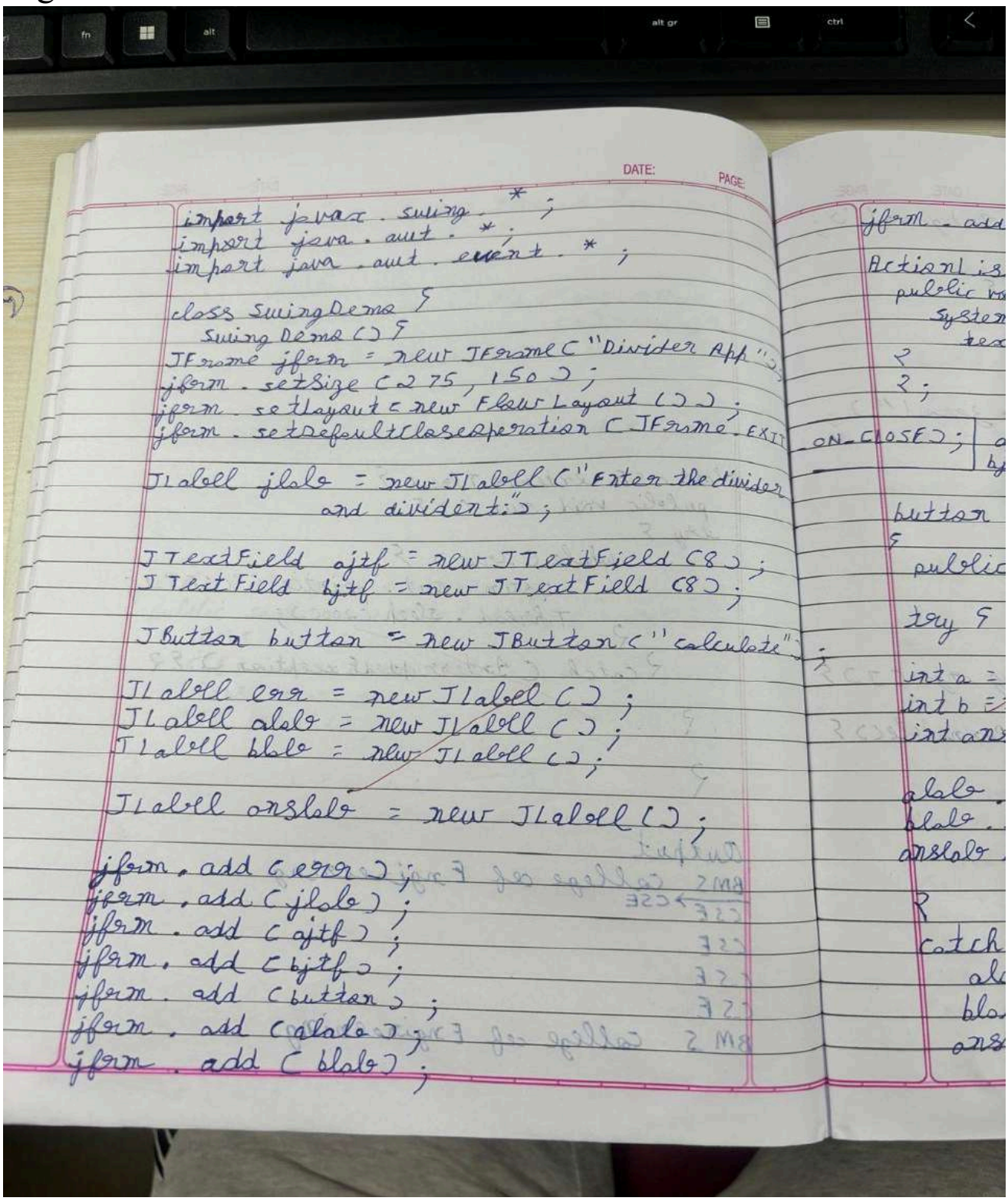
File Edit View

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

public class Multithreading{
    public static void main(String[] args) {
        BMS bms = new BMS();
        CSE cse = new CSE();
        bms.start();
        cse.start();
    }
}

Annas Sharieff 1bm23cs041
```

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

Program 9- Integer Division With User Interface:

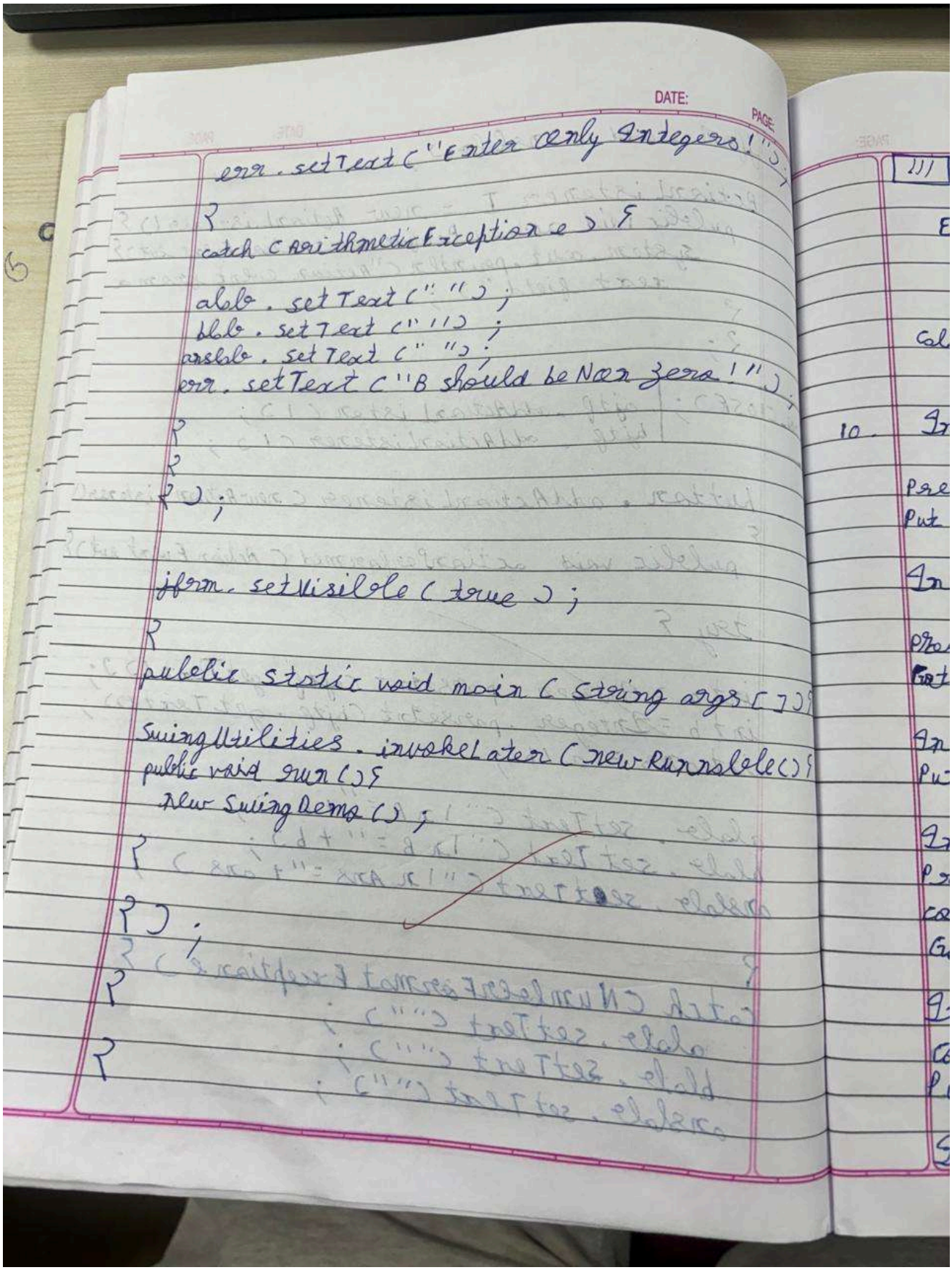
Algorithm:



```
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

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

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

JButton button = new JButton("calculate");

JLabel err = new JLabel();
JLabel alab = new JLabel();
JLabel blab = new JLabel();

JLabel anslab = new JLabel();

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

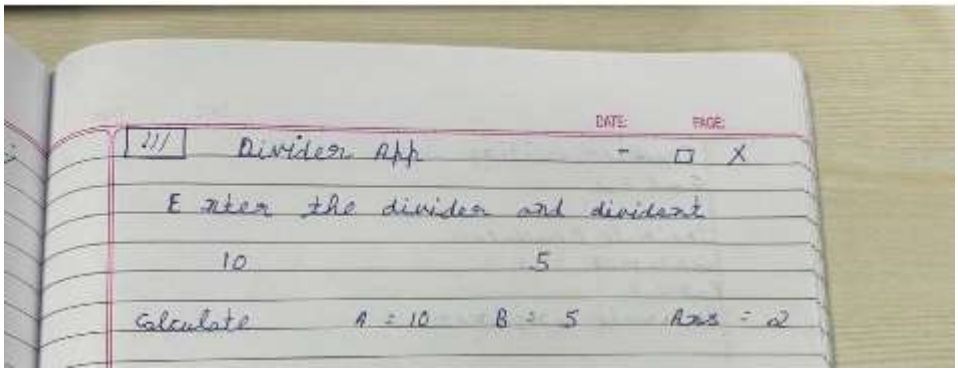
DATE: PAGE:

```
jfrm.add(anslbl);

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

ON_CLOSE);   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;

albl.setText("1st A="+a);
blbl.setText("1st B="+b);
anslbl.setText("1st Ans="+ans);

}
catch(NumberFormatException e) {
  albl.setText("");
  blbl.setText("");
  anslbl.setText("");
```



err.setText("Enter only Integers!");
}
catch(ArithmeticException e){
alab.setText("");
blab.setText("");
ansLab.setText("");
err.setText("B should be Non Zero!");
}
}
});

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

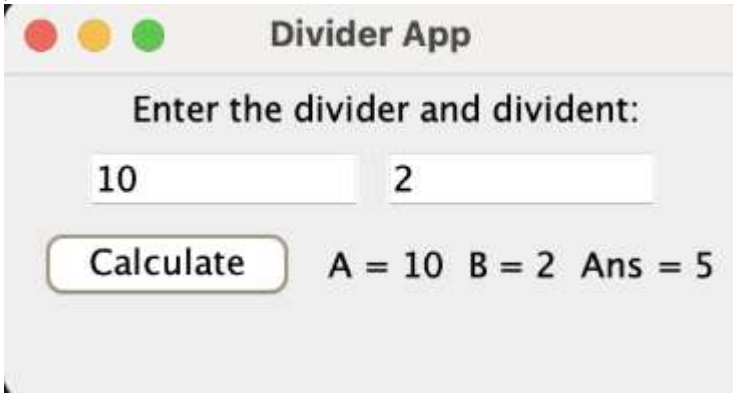


Code:

```
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();
```

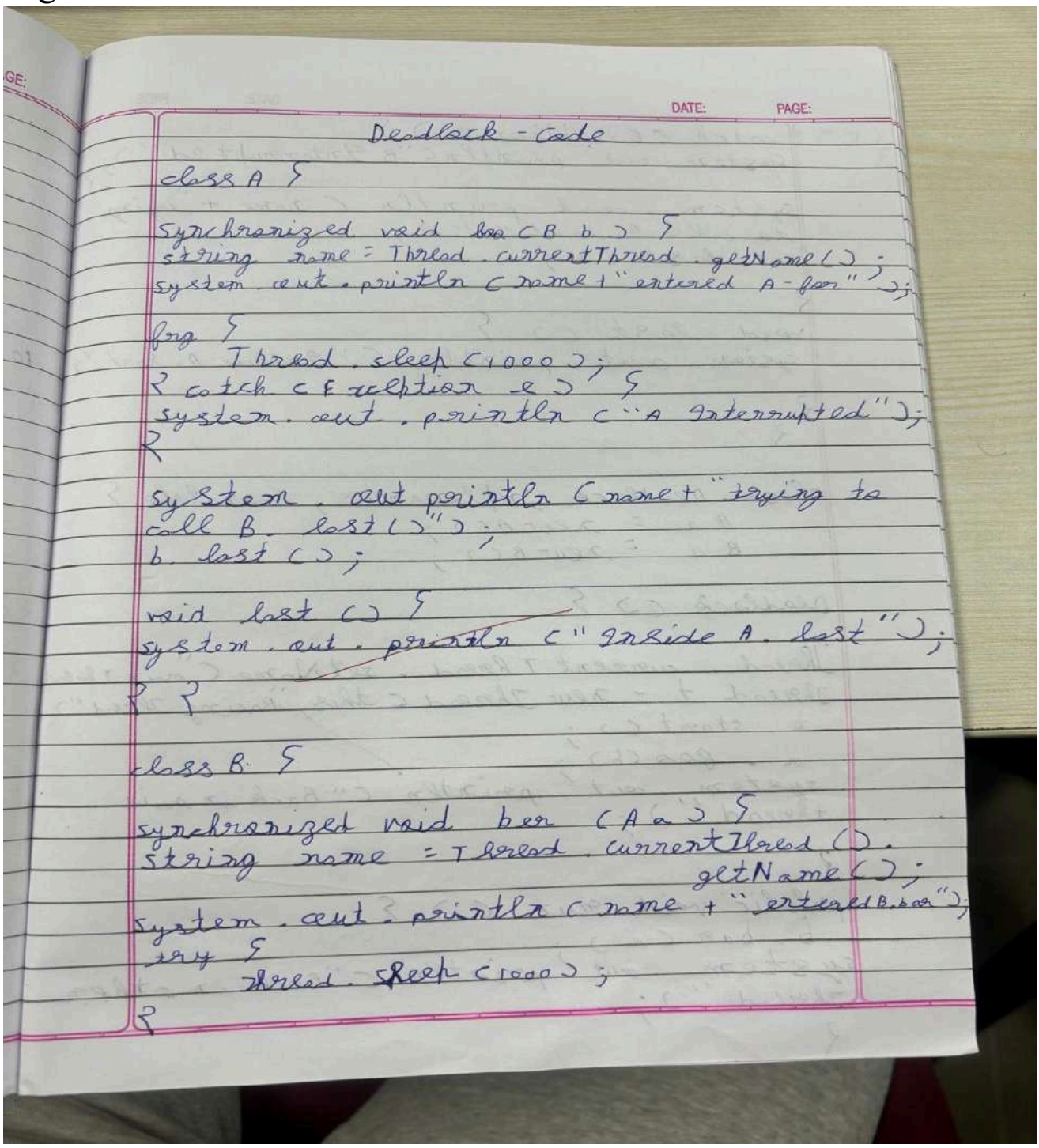
```
JLabel anslab = new JLabel();
// add in order :)
jfrm.add(err); // to display error bois
jfrm.add(jlab);
jfrm.add(ajtf);
jfrm.add(bjtf);
jfrm.add(button);
jfrm.add(alab);
jfrm.add(blab);
jfrm.add(anslab);
ActionListener l = new ActionListener() {
public void actionPerformed(ActionEvent evt) {
System.out.println("Action 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[]){
System.out.println("Ritesh Mohan Nayak 1BM23EC212");
// create frame on event dispatching thread
SwingUtilities.invokeLater(new Runnable(){
public void run(){
new SwingDemo();
}
});
}
}
```



Program 10- IPC And Deadlock:

Algorithm:



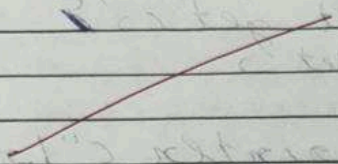
Deadlock - Code

```
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 a = 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");
}
```

DATE: PAGE:

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



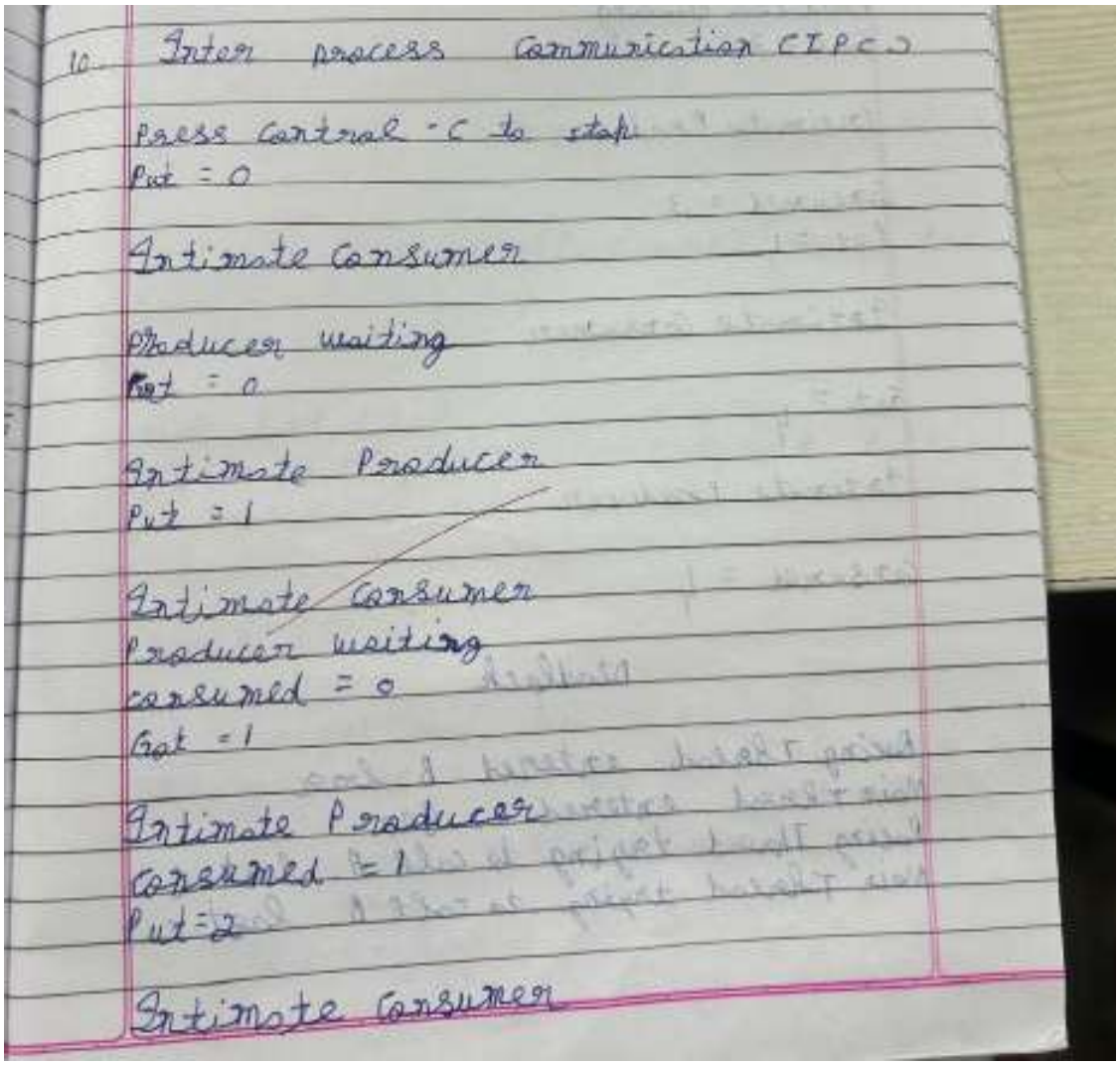
DATE: PAGE:

IPC code

```
class Q {

int n;
boolean valueset = false;
synchronized 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("Interrupted Exception
caught");
}
this.n = n;
valueset = true;
System.out.println("Put = " + n);
System.out.println("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) {
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");

}

}
```


10. Inter process Communication (IPC)

Press Control + C to stop

Put = 0

Intimate Consumer

Producer waiting

Put = 0

Intimate Producer

Put = 1

Intimate Consumer

Producer waiting

consumed = 0

Get = 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

Got = 4

Intimate Producer

Consumed = 4

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()

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

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 thisthread.
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();
}
}
```

```
Microsoft Windows [Version 10.0.22621.4169]
(c) Microsoft Corporation. All rights reserved.

C:\Users\smart>cd desktop

C:\Users\smart\Desktop>javac PCFixed.java

C:\Users\smart\Desktop>java PCFixed
Press Control-C to stop.
Put: 0

Intimate Consumer


Producer waiting

Got: 0

Intimate Producer

Put: 1

Intimate Consumer


Producer waiting

consumed:0
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
```

```
Producer waiting

Got: 6

Intimate Producer

consumed:6
Put: 7

Intimate Consumer


Producer waiting

Got: 7

Intimate Producer

consumed:7
Put: 8

Intimate Consumer


Producer waiting

Got: 8
```

```
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
```

```
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

C:\Users\smart\Desktop>annas sharieff 1bm23cs041
```

```
MainThread entered A.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
```