VISVESVARAYA TECHNOLOGICAL UNIVERSITY

"JnanaSangama", Belgaum -590014, Karnataka.



LAB REPORT on

Object Oriented Java Programming (23CS3PCOOJ)

Submitted by

Afreen Anz (1BM23CS016)

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 **Afreen Anz (1BM23CS016)**, who is bonafide student of **B.M.S. College of Engineering.** It is in partial fulfillment for the award of **Bachelor of Engineering in Computer Science and Engineering** of the Visvesvaraya Technological University, Belgaum. The Lab report has been approved as it satisfies the academic requirements in respect of an Object Oriented Java Programming (23CS3PCOOJ) work prescribed for the said degree.

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

Index

Sl. No.	Date	Experiment Title	Page No.
1	9/10/24	Implement Quadratic Equation	4
2	16/10/24	Calculate SGPA	8
3	23/10/24	Constructors and Methods	14
4	23/10/24	Abstract Class	18
5	30/10/24	Inheritance	23
6	13/11/24	Packages	31
7	20/11/24	Exception Handling	38
8	27/11/24	Multithreading	43
9	27/11/24	DeadLock and IPC	46
10	27/11/24	Create Calculator	52

Github Link:

https://github.com/1BM23CS016/Java-lab

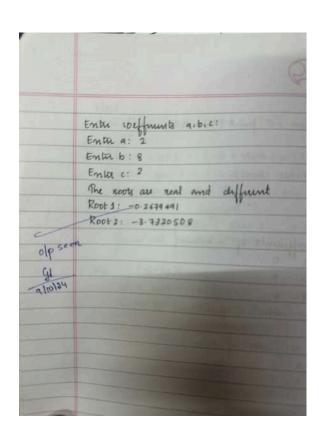
Program 1

Implement Quadratic Equation

Qerelop a Java paogram that prints all zeal solutions to the quadratic equation az²+bz+c=o. Read a, b, c and use the quadratic formula. If the discuminate b²-tac vis negative, duplary a message staling that there are no real solutions → import jorra. util. Scannes; public class quadratic f public static void main (string [] args) f Scanner scanner = new scanner (system-im); system out permt ["Entre coefficients of a, b, c] system out permt ("Entre a: "); double a = scanner next Double (); system out permt ("Entre b: "); double b = scanner next Double (); system out permt ("Entre c: "); double b = scanner next Double (); system out permt ("Entre c: "); double c = scanner next Double (); system out permt ("Entre c: "); double c = scanner next Double (); system out permt ("Entre c: "); double c = scanner next Double (); system out permt ("Not a quadratic equation") }	O E	classwate Date
xeal southons to the guadratic equation ax²+bz+c=0. Read a, b, c and use the quadratic formula: of the discussionable b²-4ac is negative, duplany a message Statung that there are no real southous import joura. util. Scannes; public class quadratic f public static void main (String [] augs) f Scanner sconner = new sconner (system.im); System. out pant In ("Enter a: "); double a = sconner next Double (); System. out pant ("Enter b: "); double b = Scanner next Double (); System. out pant ("Enter b: "); double b = Scanner next Double (); System. out pant ("Enter b: "); double b = Scanner next Double (); System. out pant ("Enter b: "); double b = Scanner next Double ();	9/10/2	1 LAB PROGRAM-1
zeal southons to the guadratic equation ax²+bz+c=0. Read a, b, c and use the quadratic formula: If the discussionable b²-fac is negative, display a message Stating that there are no real southous import jora. util. Scannes; public class quadratic f public static void main (String [] augs) f Scanner sconner = new sconner (system.in); System. out pant In ("Enter a: "); double a = sconner next Double (); System. out pant ("Enter b: "); double b = scanner next Double (); System. out pant ("Enter b: "); double b = scanner next Double (); System. out pant ("Enter b: "); double b = scanner next Double ();		Develop a Java beggam that beints all
ax²+bz+c=0. Read a, b, c and use the quadratu formula. If the discuminate b²-tac he negative, duplany a message Statung that there are no real Estatung that there are no real Estatung import jora. util. Scannes; public class quadratic f public static void main (String [] angs) f Scanner Scanner = new Scanner (System.in); System. out pant In ("Enter coefficients of a, b, c) System. out pant ("Enter a: "); double a = Scanner next Double (); System. out pant ("Enter b: "); double b = Scanner next Double (); System. out pant ("Enter b: "); double b = Scanner next Double ();	a Com	real solutions to the quadrate constron
quadratu formula: of the discuminate b^2 - 4ac	Total B	
b2-fac is negative, duplay a message Stalong that there are no real Exorntions import journell! Scannes; public class quadrative { public static void main (Stange 1) args) { Scanner scanner = new scanner (System-in); System out pant In ("Enter coefficients of a, b, c:) System out pant ("Enter a: "); double a = scanner next Double (); System out pant ("Enter b: "); double b = scanner next Double (); System out pant ("Enter b: "); double to = scanner next Double (); System out pant ("Enter c: "); double to = scanner next Double (); System out pant ("Enter c: "); double to = scanner next Double (); System out pant ("Enter c: "); double to = scanner next Double (); System out pant ("Enter c: ");		quadraty formula: of the discussionals
Stating that there are no real solutions import jorna. util. Scanner; public class quadratic f public static void main (String [] augs) f Scanner scanner = new scanner (system.in); System. out paret In ("Enter a:"); System. out paret ("Enter a:"); System. out paret ("Enter b:"); double a = scanner next Double (); System. out paret ("Enter b:"); double b = scanner next Double (); System. out paret ("Enter b:"); double t = scanner next Double ();		b2-tac is asserting diplored a meregar
public class quadratic { public class quadratic { public static void main (string [] args) { Scanner scanner = new scanner (system-in); System out pant In ("Enter acefficients of a, b, c:) System out pant ("Enter a:"); double a = scanner next Double (); System out pant ("Enter b: "); double b = scanner next Double (); System out pant ("Enter b: "); double b = scanner next Double (); System out pant ("Enter b: "); double c = scanner next Double ();		Stalona that there are
public class quadratic f public static void main (string [] angs) f Scanner sconner = new sconner (system-in); System out pant ["Enter coefficients of a, b, c") System out pant ("Enter a: "); double a = sconner next Double (); System out pant ("Enter b: "); double b = sconner next Double (); System out pant ("Enter b: "); double b = sconner next Double (); System out pant ("Enter c: "); double c = sconner next Double ();	98	
public class quadratic f public static void main (string [] angs) f Scammer scanner = new scanner (system-in); System out pant ["Enter coefficients of a, b, c") System out pant ("Enter a: "); double a = scanner next Double (); System out pant ("Enter b: "); double b = scanner next Double (); System out pant ("Enter b: "); double to = scanner next Double (); System out pant ("Enter c: "); double to = scanner next Double ();		THE PROPERTY AND CONTRACTOR OF
public static void main (Staing [] args) f 8 commer scommer = new scommer (System_im); 8 yetem out pant In ("Enter coefficients of a, b, c") 8 yetem out pant ("Enter a: "); double a = scommer mext Double (); 8 yetem out pant ("Enter b: "); double b = scommer next Double (); 8 yetem out pant ("Enter b: "); double t = scommer next Double (); 8 yetem out pant ("Enter c: "); double t = scommer next Double ();	→	import jora. util scanner;
bublic static void main (Staing [] args) { 8 commer scommer = new scommer (System.im); 8 yeters out pant ("Enter coefficients of a, b, c.") 8 yeters out pant ("Enter a: "); double a = scommer mext Double (); 8 yeters out pant ("Enter b: "); double b = scommer next Double (); 8 yeters out pant ("Enter c: "); double t = scommer next Double (); 8 yeters out pant ("Enter c: "); double t = scommer next Double ();		public class quadraticf
Scomma scomma = new scommer (System_in); System out pant ("Entre acificients of a, b, c") System out pant ("Entre a: "); double a = scommer mext Double (); System out pant ("Entre b: "); double b = scommer mext Double (); System out pant ("Entre b: "); double b = scommer mext Double (); System out pant ("Entre b: "); double c = scommer mext Double ();		
double a = 'scommu mort Double (); 8ystem out pant ("Entre b: "); double b = scommu mort Double (); 8ystem out punt ("Entre 4: "); double T = scommu mort Double ();		
double a = 'scommu mort Double (); 8ystem out pant ("Entre b: "); double b = scommu mort Double (); 8ystem out punt ("Entre 4: "); double T = scommu mort Double ();		System out punt in ("Entre coefficients of a, b, c")
System out pant ("Entir b: "); double b = Scanner next Double (); System out pant ("Entir c: "); double T = sconner next Double ();		System out part ("Entir a: "),
double b = "scanner nextDouble(); System out punt ("Enter 4: "); double t = scanner next Double();	19	double a = Scomma mortholible ();
System out punt ("Enter c: "); doubte t = scomme next Double();		System out paint (Enu b.)
double ();	4	double b = scanna nextenders,
11 (0000)		Sycano out print ("Enu L.")
"if (8000) (Suntano out broat ("Not a quadratu equation") 3		
Buston out pront ("Not a quadratu equation") 3	1	1 (augm) (
		Busin out benut ("Not a quadratu equation") 3

System out punt ("no real roots"); elsel double d= (b+b)-(4+a+c); double root 1 = (-b + Math sqrt(d)) / (2+a); Scommet close (); double not 2 = (-b + Math - sqrt(d)) / (2 + a)System out print in ("The xoots are real and defaunt "); System out puntln" ("Root 1: " + 2001 1); of Enter coefficients of a , b , c : System out puntln ("Root 2: " + noot 2); Entre a! 0 Entu b: + else of (d==0){

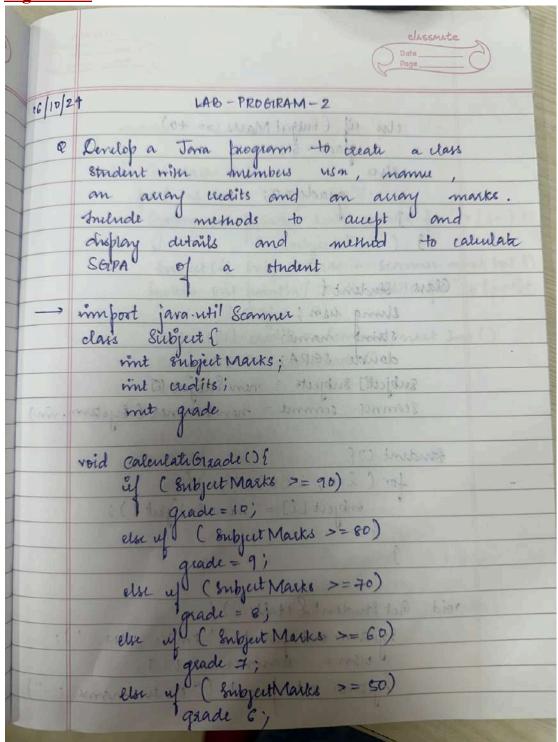
double 2001 = -6/(2*4); Entu &c: 6 Not a quadratu equation System-out puntly ("The roots are real and equal");
System out puntle ("Root: " + 200t); Entre coefficients of a, b, c: Entu b: 7 else 1 Entre 1: 9 double realfast = b/(2 x a); double imaglast = warn squt(d)/(2 ea); No real roots System out funtto ("Roots are complex and defferent "); fanttim ("Root 1: " + HealPart + Entre coefficients of a.b.c. Enter a: "+" + 2magfast + ";"); Entr b: \$ Systems out printly ("Root 2:" + real Part + "-Enter C: The xeoty are real and equal + imagPart + "i"); Root : -10



```
import java.util.Scanner;
public class QuadraticEquations{
  public static void main(String[] arg) {
     Scanner scanner = new Scanner(System.in);
     System.out.print("Enter a: ");
     double a = scanner.nextDouble();
     System.out.print("Enter b: ");
     double b = scanner.nextDouble();
     System.out.print("Enter c: ");
     double c = scanner.nextDouble();
     double d = b * b - 4 * a * c;
       System.out.println("aaryan");
     if (d > 0) {
       double root1 = (-b + Math.sqrt(d)) / (2 * a);
       double root2 = (-b - Math.sgrt(d)) / (2 * a);
       System.out.println("Real Roots");
       System.out.println("Root 1: " + root1);
       System.out.println("Root 2: " + root2);
       else if (d == 0) {
       double root = -b / (2 * a);
       System.out.println("Roots are real and equal");
       System.out.println("Root: " + root);
       else {
       System.out.println("Roots are complex");
     scanner.close();
```

```
D:\1BM23CS016>java quadratic.java
Enter the coefficients of a,b,c:
Enter a: 5
Enter b: 7
Enter c: 9
no real roots
NAME: AFREEN ANZ
USN: 1BM23CS016
D:\1BM23CS016>java quadratic.java
Enter the coefficients of a,b,c:
Enter a: 2
Enter b: 4
Enter c: 2
The roots are real and equal.
Root: -1.0
NAME: AFREEN ANZ
USN: 1BM23CS016
D:\1BM23CS016>java quadratic.java
Enter the coefficients of a,b,c:
Enter a: 2
Enter b: 8
Enter c: 2
The roots are real and different.
Root 1: -0.2679491924311228
Root 2: -3.732050807568877
NAME: AFREEN ANZ
USN: 1BM23CS016
D:\1BM23CS016>java quadratic.java
Enter the coefficients of a,b,c:
Enter a: 0
Enter b: 4
Enter c: 6
Not a quadratic quation
NAME: AFREEN ANZ
USN: 1BM23CS016
```

Calculate SGPA (Student Class)



```
else iil ( Entijul Marts >= 40)
                                                                                           manne = scannu must ();
              grade = 5;
                                                                                        void Gut Macks () (
                    grade = 0;
                                                                                               for ( mnt i=0; ice; i++)f
                                                                                                Sporture only printly "Entre marks for" + (i+1) +

"Enbject": ");

Inspect [i]. Enbject Marks = Scormer ment Int ()

Systom ont punt by "Enth credits for" + (i+1) +

"Subject !");
  Class Student (
           Elima usn;
                                                                                                   " Embject!");
Subject[i] credits = Scarmer next Int()
          string name;
          double SEIPA;
                                                                                                   Subject (i) · Calendate Greade () ;
       Subject | Subject = new Subject 19
       Scannet scomme = new scanner ( bystero. vin)
   Strudent () (
                                                                                       void SOIPA()[
         for ( i=0; i(8; i+4){
                                                                                                  double Score = 0;
               inspect[i] = new inspect();
                                                                                                   mut total-redits = 0;
                                                                                                    for (mt 1=0; 128; 1++){
                                                                                                    score = score + (subject [1] event to the subject [1] quade );

-total = event to + = subject [1] = event to ;
reid Get Student Details () [
                                                                                               1 -total-cuents > 0) (
SEPA = score / -total-cuents )
         System out print ("Enter usn: ");

ersn = sconner mat();
         System out promit (" Enter nome : ");
                                                                                                else f
SGPA = 0;
             system out famil ("USN: " + um);

system out famil ("Name: " + name);

system out famil ("SOLPA: " + SGIPA);

3
                                                                                       Entry details for student &
Entry the USN IEM2285036
Entry Norma : African
                                                                                        Enter marks for subject 1 97
Enter executes for subject 2 97
Enter analysis for subject 2 98
Enter marks for subject 2 3
Enter marks for subject 3 95
      public class stud Details (
                                                                                           Enter credit for subject 3:
                   public stoom void mam ( 8 hring [] augu)
                                                                                          Enter credits for subject 4: 3
                     student [] students = new student [5]
                  for (j=0; j=3; j++)! Enter detouts for
                                                                                           Entre marks for integer 5:
                                                                                           Enter credits for integet 5: 3.
Enter mains for integet 6: 45
trates credits for integet 6: 2
                          Student "+ (j+1) "+);
                         Stridents[j] = new strident()
                                                                                            tulu marks for subject 7
                         the think till get
                                                                                             Entre cudits for intiget 7
```

Enter marks for entpirt 8

LIST: 18M2308016

Nome: African MGIPA: 915714285714

students () Get & trickent Defoils ();

Strounts [] Gul Marts (); (Indust () SGIPA();

for (wint iso; 163; 1++) f

Anderts [j] obsiday ();

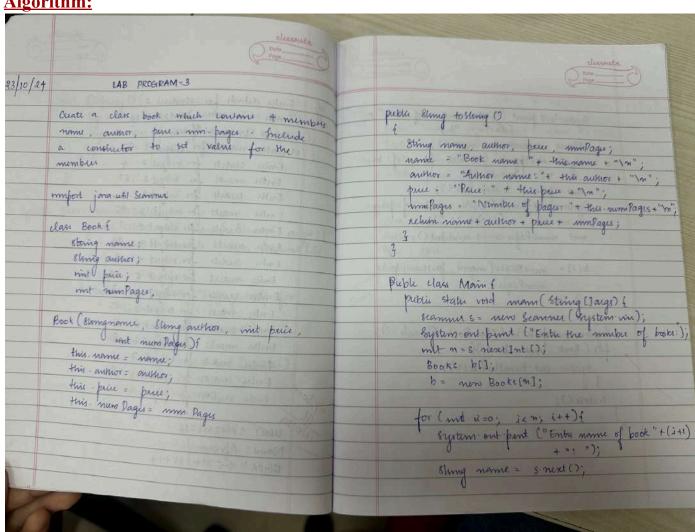
```
import java.util.Scanner;
class Subject {
  int subjectMarks;
  int credits;
  int grade;
  void calculateGrade() {
     if (subjectMarks \geq 90) {
       grade = 10;
     } else if (subjectMarks >= 80) {
       grade = 9;
     } else if (subjectMarks >= 70) {
       grade = 8;
     } else if (subjectMarks >= 60) {
       grade = 7;
     } else if (subjectMarks >= 50) {
       grade = 6;
     } else if (subjectMarks >= 40) {
       grade = 5;
     } else {
       grade = 0; // Fail
class Student {
  String usn;
  String name;
  double SGPA;
  Subject[] subjects = new Subject[8];
  Scanner scanner = new Scanner(System.in);
  Student() {
     for (int i = 0; i < 8; i++) {
       subjects[i] = new Subject();
  }
  void getStudentDetails() {
     System.out.print("Enter the USN: ");
     usn = scanner.next();
     System.out.print("Enter the Name: ");
```

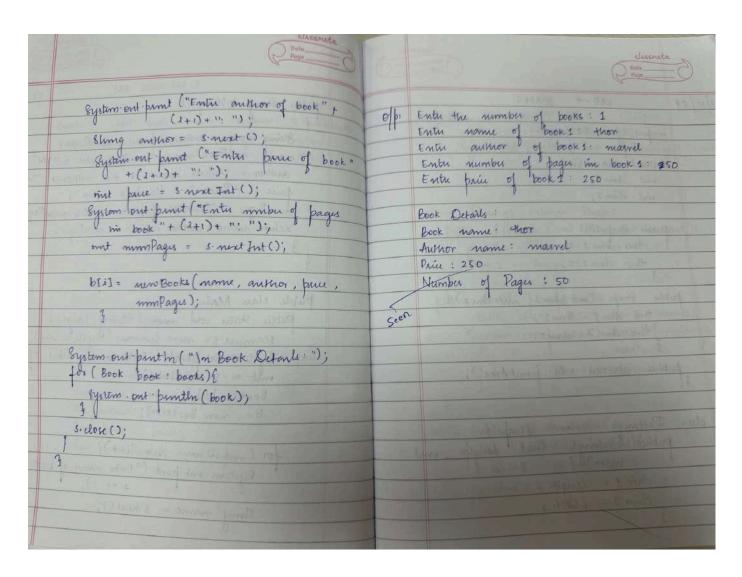
```
name = scanner.next();
  void getMarks() {
     for (int i = 0; i < 8; i++) {
       System.out.print("Enter marks for subject " + (i + 1) + ": ");
       subjects[i].subjectMarks = scanner.nextInt();
       System.out.print("Enter credits for subject " + (i + 1) + ": ");
       subjects[i].credits = scanner.nextInt();
       subjects[i].calculateGrade();
  void computeSGPA() {
     double effectiveScore = 0;
     int totalCredits = 0;
     for (int i = 0; i < 8; i++) {
       effectiveScore += (subjects[i].grade * subjects[i].credits);
       totalCredits += subjects[i].credits;
     SGPA = (totalCredits > 0) ? (effectiveScore / totalCredits) : 0;
  void display() {
     System.out.println("USN: " + usn);
     System.out.println("Name: " + name);
     System.out.println("SGPA: " + SGPA);
public class StudDetails {
  public static void main(String[]args) {
     Student[] students = new Student[3];
     for (int j = 0; j < 3; j++) {
       System.out.println("Enter the details for student " + (j + 1) + ":");
       students[i] = new Student();
       students[i].getStudentDetails();
       students[j].getMarks();
       students[j].computeSGPA();
     for (Student student : students) {
       student.display();
```

```
}
D:\usn16>java StudDetails
Enter the details for student 1:
Enter the USN: 1BM23CS016
Enter the Name: Afreen
Enter marks for subject 1: 97
Enter credits for subject 1: 4
Enter marks for subject 2: 87
Enter credits for subject 2: 3
Enter marks for subject 3: 95
Enter credits for subject 3: 4
Enter marks for subject 4: 86
Enter credits for subject 4: 3
Enter marks for subject 5: 89
Enter credits for subject 5: 3
Enter marks for subject 6: 95
Enter credits for subject 6: 2
Enter marks for subject 7: 96
Enter credits for subject 7: 1
Enter marks for subject 8: 93
Enter credits for subject 8: 1
Enter the details for student 2:
Enter the USN: 1BM23CS017
Enter the Name: Aisha
Enter marks for subject 1: 93
Enter credits for subject 1: 4
Enter marks for subject 2: 92
Enter credits for subject 2: 4
Enter marks for subject 3: 81
Enter credits for subject 3: 3
Enter marks for subject 4: 83
Enter credits for subject 4: 3
Enter marks for subject 5: 99
Enter credits for subject 5: 3
Enter marks for subject 6: 98
Enter credits for subject 6: 2
Enter marks for subject 7: 91
Enter credits for subject 7: 1
Enter marks for subject 8: 83
Enter credits for subject 8: 1
```

```
Enter the details for student 3:
Enter the USN: 1BM23CS047
Enter the Name: Aparna
Enter marks for subject 1: 92
Enter credits for subject 1: 4
Enter marks for subject 2: 93
Enter credits for subject 2: 4
Enter marks for subject 3: 85
Enter credits for subject 3: 3
Enter marks for subject 4: 81
Enter credits for subject 4: 3
Enter marks for subject 5: 89
Enter credits for subject 5: 3
Enter marks for subject 6: 94
Enter credits for subject 6: 2
Enter marks for subject 7: 99
Enter credits for subject 7: 1
Enter marks for subject 8: 85
Enter credits for subject 8: 1
USN: 1BM23CS016
Name: Afreen
SGPA: 9.571428571428571
USN: 1BM23CS017
Name: Aisha
SGPA: 9.66666666666666
USN: 1BM23CS047
Name: Aparna
SGPA: 9.523809523809524
D:\usn16>_
```

Constructors and methods (Book Class)





import java.util.Scanner;

```
class Book {
    // Class members
    String name;
    String author;
    int price;
    int numPages;

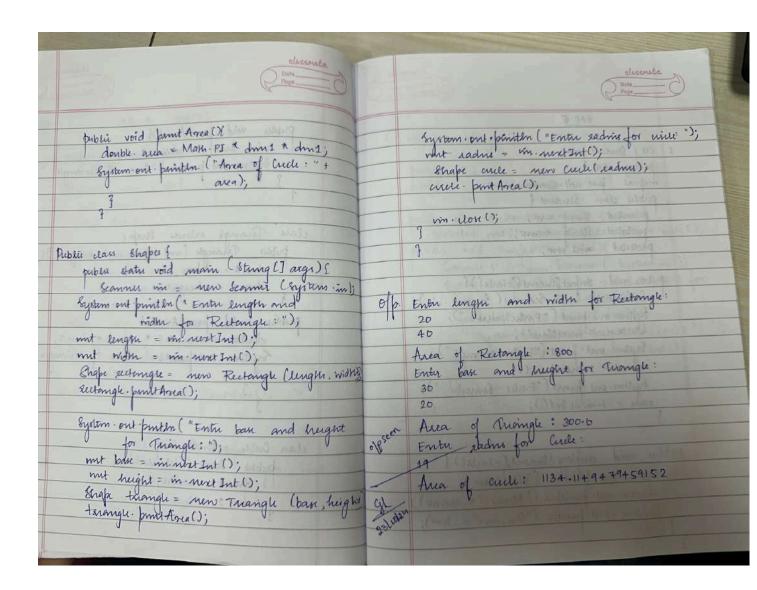
Book(String name, String author, int price, int numPages) {
        this.name = name;
        this.author = author;
        this.price = price;
        this.numPages = numPages;
    }
}
```

```
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();
System.out.println("Name: Afreen Anz\n1BM23CS016");
}
```

D:\cs3a>java Main Enter the number of books: 3 Enter name of book 1: thor Enter author of book 1: afreen Enter price of book 1: 250 Enter number of pages in book 1: 40 Enter name of book 2: iron Enter author of book 2: afeefah Enter price of book 2: 200 Enter number of pages in book 2: 50 Enter name of book 3: amal Enter author of book 3: captain Enter price of book 3: 300 Enter number of pages in book 3: 60 Book Details: Book name: thor Author name: afreen Price: 250 Number of pages: 40 Book name: iron Author name: afeefah Price: 200 Number of pages: 50 Book name: amal Author name: captain Price: 300 Number of pages: 60 Name : Afreen Anz 1BM23CS016 D:\cs3a>_

Program 4
Abstract Class (Shape Class)

lgorithm:	
Classificate Date Pripe	diasente Duris Duris
0/24 LAB-+ SHAPES	
The Bride Have Standard State &	Dustin will be all out
import java-util-Scanner;	Public void pund-Anea ()4
AMERICAN CONTRACTOR OF THE PROPERTY OF THE PRO	wint area = drins + drins 2,
abstract class Shape f	System out puntin ("Ance of Zectangle: "+ are
mit dim 1;	1
rint dim 2;	and the second s
Park & October & Date of the Control	class Tirange extends shape (
public Shape Of	public Perongle (mit base, mit neight)?
this - drim 1 = 0;	ohm 1 = base;
this dm 2=0;	dm2 = height;
Matthewall Maren 2020	dm2 = height;
public Shape (int dms, mit dm2) 2	public void punt Area ()2
this dm1 = ahm1;	clouble area = 05 * drm1 * drm2;
this dm 2 = dm2;	Sustem out builter ("Area of Riongie:"
- 3 COLUMN TO ROW DAY TO SHARE	area);
public abstract void funct Area();	CaloA Card Agraday
	3
	TANK AND MAN MAN WIND TO SERVE SHEET SWINGS
class Rectangle extends Strape &	clan Circle extends shape ?
public Rectangle Count length, int width) { chim 1 = length; clim 2 = 1184	public Circle (mit sadns)
midm) {	dm 1 = xadni;
drin 1 = length;	alm 2 = 0
q chim 2 = midth;	olym 2 = 0;
3	1000



```
import java.util.Scanner;

abstract class Shape {
  int dim1;
  int dim2;

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

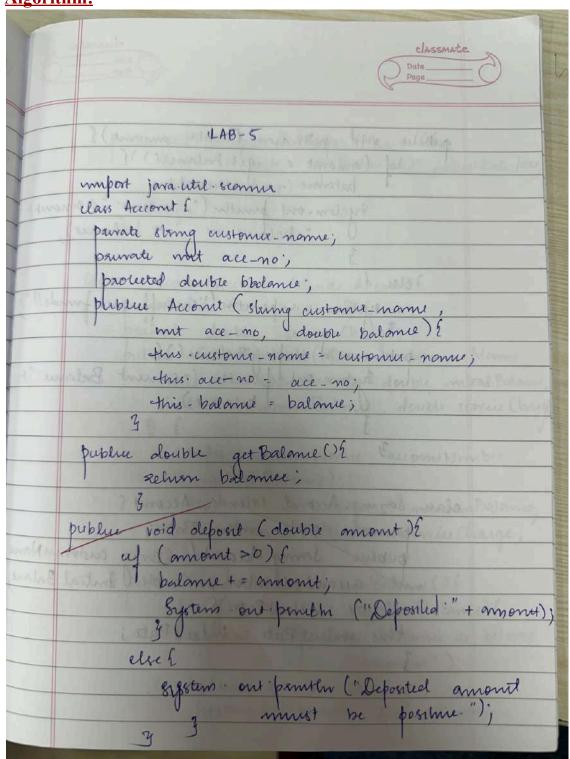
public Shape(int dim1, int dim2) {
    this.dim1 = dim1;
    this.dim2 = dim2;
```

```
}
  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;
     dim 2 = 0;
  public void printArea() {
     double area = Math.PI * dim1 * dim1;
     System.out.println("Area of Circle: " + area);
```

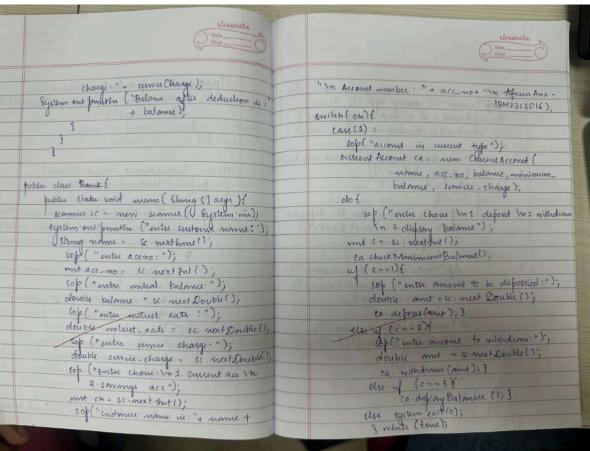
```
public class shapes {
  public static void main(String[] args) {
     Scanner in = new Scanner(System.in);
     System.out.println("Enter length and width for Rectangle:");
     int length = in.nextInt();
     int width = in.nextInt();
     Shape rectangle = new Rectangle(length, width);
     rectangle.printArea();
     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();
System.out.println("Name: Afreen Anz\n1BM23CS016");
  }
}
```

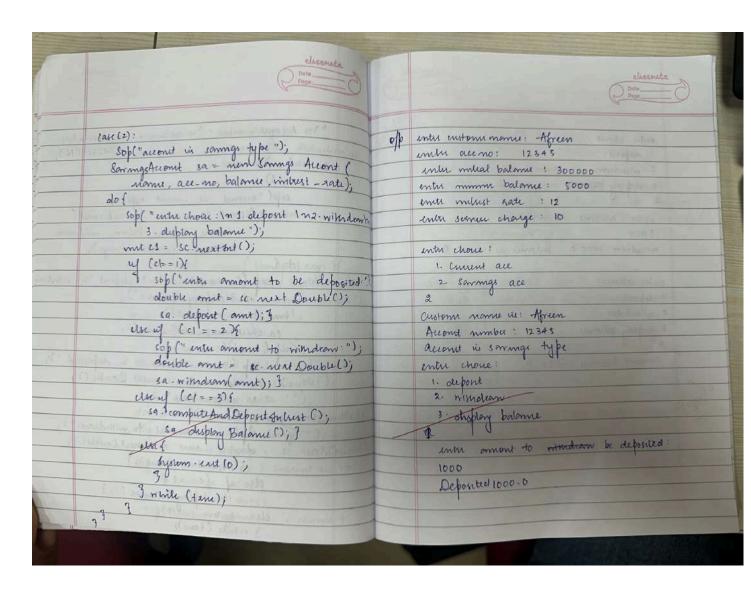
```
D:\cs3a>javac shapes.java
D:\cs3a>java shapes
Enter length and width for Rectangle:
20
40
Area of Rectangle: 800
Enter base and height for Triangle:
30
20
Area of Triangle: 300.0
Enter radius for Circle:
19
Area of Circle: 1134.1149479459152
Name : Afreen Anz
1BM23CS016
D:\cs3a>_
```

Inheritance (Bank Class)



```
gublus void nitudian (double amount) {
                                                                     public void compute-And Depositrileus () ?
     uf (amount <= get Balance()){
balonce -= amount;
                                                                          double instead = ger Balance () * instead Rate 100
                                                                           alepost (miteust);
          System out printer ("withdrew" + amounts
               " balance vis " + balance);
                                                                  Class Curunt Account Extends Account f
        system. out paratha ("hisufficient frieds !!")
                                                                       primate double monomobalance;
                                                                       prima double service thang;
    public void display Balance () & System and button ("Current Balance")
                                                                       public Eccent Account ( Slong conform Nome, mut account Number, double untal Bolomo,
                     balance);
                                                                           double minimum Balance, double service Charge
                                                                                Super (customer Nome, accomornimon,
                                                                                 emilial Balance);
clan Sommys Account extends Account &
                                                                                this minima Pollones . mmm Balance,
     primare doubt imbust Rate;
                                                                                this beawer Charge = serrie Charge;
      public Samy Account ( 80mg custome Nama
    most account Mamber, double Initial Balance,
                                                                         public void abset/mmmBalance() {
    if (get Balance) ( ammmBalance) f
      this intent Rate = Interst Rate;
                                                                                I system our penetha ("Bolome is below
                                                                                 butonie - servis (harge)
hystem out panish ("Didued annece
```





```
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);
       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;
```

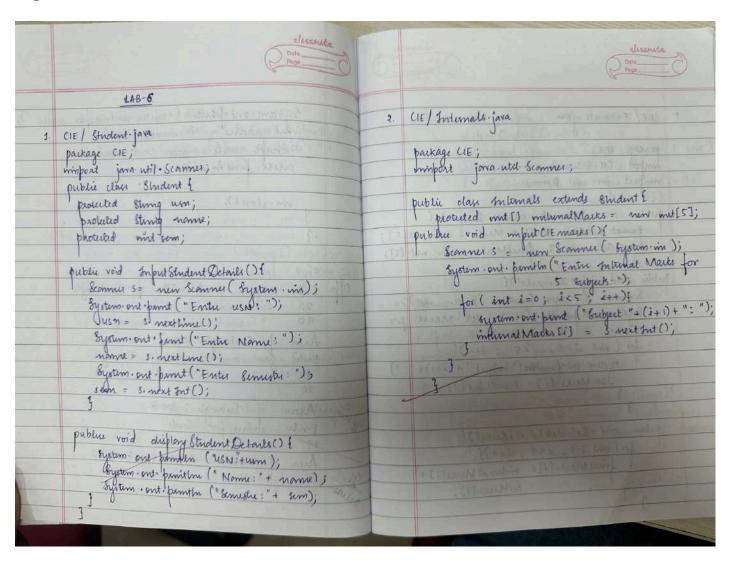
```
public void checkMinimumBalance() {
     if (getBalance() < minimumBalance) {</pre>
       System.out.println("Balance is below minimum");
       balance-=serviceCharge;
       System.out.println("Deducted service charge:" +serviceCharge);
       System.out.println("Balance after deduction is:"+balance);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

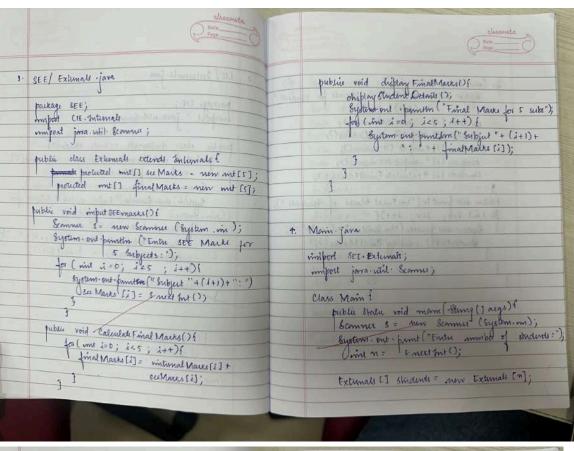
```
System.exit(0);
   }while(true);
case(2):
   System.out.println("account is savings type");
   SavingsAccount sa=new SavingsAccount(name,acc no,balance,interest rate);
  do{ System.out.println("enter choice:\n 1.deposit\n \(\frac{2}{2}\).withdraw\n 3.display balance");
   int c1=sc.nextInt();
   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);
```

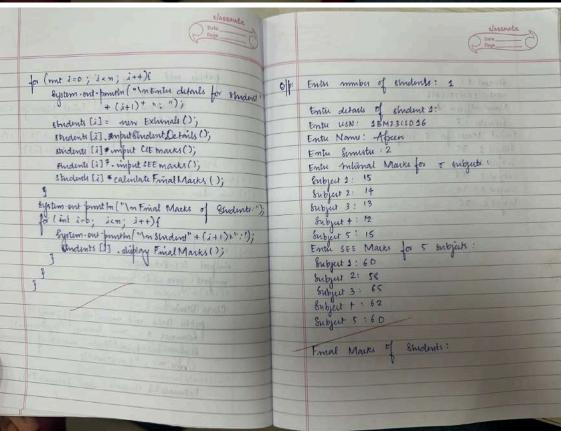
```
D:\16>java Bank
enter customer name:
Afreen
enter accno:
242424
enter initial balance:
enter minimum balance:
2000
enter interest rate:
enter service charge:
Enter choice:
1.Current acc
2. Savings acc
Customer name is:Afreen
Account number: 242424
account is current type
enter choice:
1.deposit
2.withdraw
3.display balance
enter amount to be deposited:
1000
Deposited: 1000.0
enter choice:
1.deposit
2.withdraw
3.display balance
Current Balance: 11000.0
enter choice:
1.deposit
2.withdraw
3.display balance
enter amount to withdraw:
5000
withdrew:5000.0 balance is:6000.0
enter choice:
1.deposit
Z.withdraw
3.display balance
Current Balance: 6000.0
```

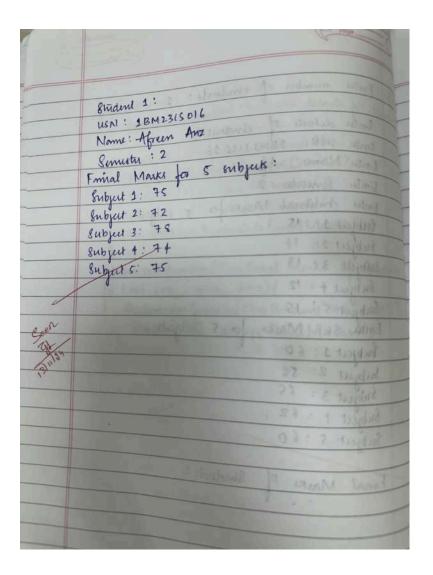
```
enter chaice:
1.deposit
2.withdraw
3.display balance
Current Balance: 6000.0
enter choice:
1.deposit
2.withdraw
3.display balance
enter amount to withdraw:
withdrew:5000.0 balance is:1000.0
enter choice:
1.deposit
2.withdraw
3.display balance
Balance is below minimum
Deducted service charge:10.0
Balance after deduction is:990.0
Current Balance: 990.0
enter choice:
1.deposit
2.withdraw
3.display balance
Balance is below minimum
Deducted service charge: 10.0
Balance after deduction is:980.0
```

Packages (Student Marks)









```
Main
import SEE.Externals;
import java.util.Scanner;

class Main {
    public static void main(String[] args) {
        Scanner s = new Scanner(System.in);
        System.out.print("Enter number of students: ");
        int n = s.nextInt();

        Externals[] students = new Externals[n];

        for (int i = 0; i < n; i++) {
            System.out.println("\nEnter details for student " + (i + 1) + ":");
            students[i] = new Externals();
            students[i].inputStudentDetails();
            students[i].inputCIEmarks();
            results are stated in the stated
```

```
students[i].inputSEEmarks();
       students[i].calculateFinalMarks();
     System.out.println("\nFinal Marks of Students:");
     for (int i = 0; i < n; i++) {
       System.out.println("\nStudent" + (i + 1) + ":");
       students[i].displayFinalMarks();
System.out.println("\n");
System.out.println("\nName: Afreen Anz\nUSN: 1BM23CS016");
  }
Externals
package SEE;
import CIE.Internals;
import java.util.Scanner;
public class Externals extends Internals {
  private int[] seeMarks = new int[5];
  private int[] finalMarks = new int[5];
  public void inputSEEmarks() {
     Scanner s = new Scanner(System.in);
     System.out.println("Enter SEE Marks for 5 subjects:");
     for (int i = 0; i < 5; i++) {
       System.out.print("Subject " + (i + 1) + ": ");
       seeMarks[i] = s.nextInt();
  }
  public void calculateFinalMarks() {
     for (int i = 0; i < 5; i++) {
       finalMarks[i] = internalMarks[i] + seeMarks[i];
  }
  public void displayFinalMarks() {
     displayStudentDetails();
     System.out.println("Final Marks for 5 subjects:");
     for (int i = 0; i < 5; i++) {
       System.out.println("Subject " + (i + 1) + ": " + finalMarks[i]);
  }
```

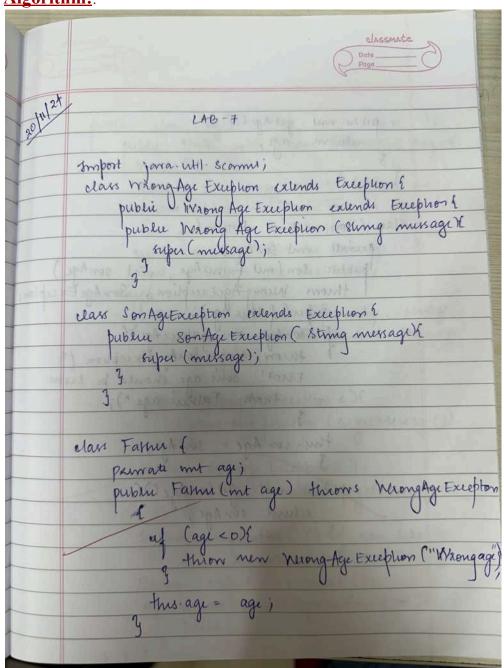
```
Internals
package CIE;
import java.util.Scanner;
public class Internals extends Student {
  protected int[] internalMarks = new int[5];
  public void inputCIEmarks() {
     Scanner s = new Scanner(System.in);
     System.out.println("Enter Internal Marks for 5 subjects:");
     for (int i = 0; i < 5; i++) {
       System.out.print("Subject " + (i + 1) + ": ");
       internalMarks[i] = s.nextInt();
Student
package CIE;
import java.util.Scanner;
public class Student {
  protected String usn;
  protected String name;
  protected int sem;
  public void inputStudentDetails() {
     Scanner s = new Scanner(System.in);
     System.out.print("Enter USN: ");
     usn = s.nextLine();
     System.out.print("Enter Name: ");
     name = s.nextLine();
     System.out.print("Enter Semester: ");
     sem = s.nextInt();
  }
  public void displayStudentDetails() {
     System.out.println("USN: " + usn);
     System.out.println("Name: " + name);
     System.out.println("Semester: " + sem);
  }
```

```
C:\Users\Admin\Desktop\1BM23CS016>java Main.java
Enter number of students: 3
Enter details for student 1:
Enter USN: 1BM23CS001
Enter Name: Afeefah
Enter Semester: 2
Enter Internal Marks for 5 subjects:
Subject 1: 12
Subject 2: 13
Subject 3: 15
Subject 4: 12
Subject 5: 15
Enter SEE Marks for 5 subjects:
Subject 1: 67
Subject 2: 68
Subject 3: 69
Subject 4: 70
Subject 5: 56
Enter details for student 2:
Enter USN: 1BM23CS002
Enter Name: Afreen
Enter Semester: 2
Enter Internal Marks for 5 subjects:
Subject 1: 15
Subject 2: 13
Subject 3: 13
Subject 4: 14
Subject 5: 15
Enter SEE Marks for 5 subjects:
Subject 1: 70
Subject 2: 69
Subject 3: 73
Subject 4: 65
Subject 5: 68
Enter details for student 3:
Enter USN: 1BM23CS003
Enter Name: Aaryan
Enter Semester: 2
Enter Internal Marks for 5 subjects:
Subject 1: 12
Subject 2: 12
Subject 3: 13
Subject 4: 13
Subject 5: 13
Enter SEE Marks for 5 subjects:
Subject 1: 67
Subject 2: 68
Subject 3: 68
Subject 4: 69
Subject 5: 70
```

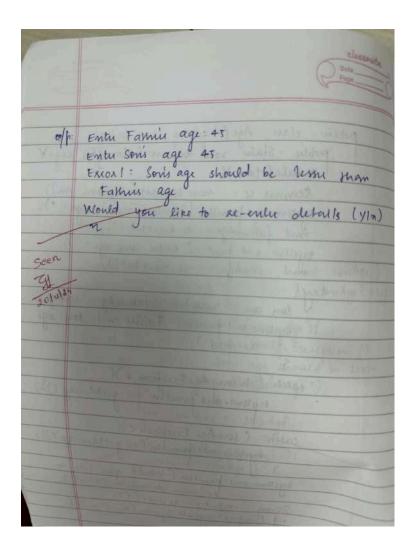
```
Final Marks of Students:
Student 1:
USN: 1BM23CS001
Name: Afeefah
Semester: 2
Final Marks for 5 subjects:
Subject 1: 79
Subject 2: 81
Subject 3: 84
Subject 4: 82
Subject 5: 71
Student 2:
USN: 1BM23CS002
Name: Afreen
Semester: 2
Final Marks for 5 subjects:
Subject 1: 85
Subject 2: 82
Subject 3: 86
Subject 4: 79
Subject 5: 83
Student 3:
USN: 1BM23CS003
Name: Aaryan
Semester: 2
Final Marks for 5 subjects:
Subject 1: 79
Subject 2: 80
Subject 3: 81
Subject 4: 82
Subject 5: 83
Name: Afreen Anz
USN: 1BM23CS016
C:\Users\Admin\Desktop\1BM23CS016> _
```

Exception Handling (Father-Son)

Algorithm:



classnate	
Dofe Page	claserate
	Dogs Copy
piblie mit get Age Of zehern age;	public class Age (
achum age;	public State void man (sting[] args)(
	while (tem) f
class vilaged paper trape	Scanne sc = new scanner (Seystem · mi);
Trendered duestry later and among interior	System out panish ("Enter Falmi age. ");
class Son eatings Farme (mt farminge = sc nextmt ();
private mit Son Age;	system out pent ("Enter Sonis age: ");
public son (mit farminage, mit sontage)	and sonAge = sc next Int ();
throws Minny Agetaublion, Son Ageta uploni	trus
super (fublic Age);	Son son = new son (fatherAge, sonAge);
uf (sonAge >= fahmeAge){	system out funtly (" Farme and son age
throw new SonAge truepron ("	acupted");
Execut! Sons age should be him	3
thom Famus age");	earch (Nisong Age Exception e) E
1	septens sont familie (e.getMessage ());
thus son Age = son Age; T male	3
The state of the s	Latet (son-Age Exception e) (
public mt get Son Age () (* system out familia (c.get Message ());
Relium con Age () (3
	System out puntion (Would you like to
AN Treather & James was and the	Re-entry defaults (Y/n)");
	arma mbut = sc. next ();
1 40 o ga and	uf Emput equals 3gnore (ase ("n")) [
	breaki
	133
	一



Code:

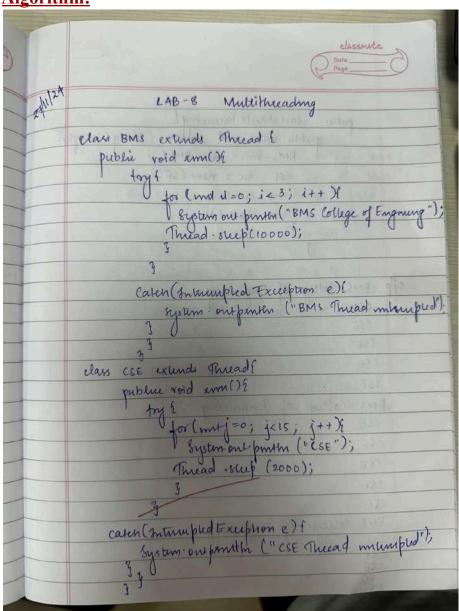
```
import java.util.Scanner;
class WrongAgeException extends Exception {
   public WrongAgeException(String message) {
      super(message);
   }
}
class SonAgeException extends Exception {
   public SonAgeException(String message) {
      super(message);
   }
}
class Father {
   private int age;
   public Father(int age) throws WrongAgeException {
      if (age < 0) {
            throw new WrongAgeException("Wrong age");
      }
}</pre>
```

```
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("Error!: Son's age should be lesser than Father's age");
    this.sonAge = sonAge;
  public int getSonAge() {
    return sonAge;
  }
public class Age{
  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("Father and Son age accepted");
       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;
       }
   }
 }
```

```
D:\16>cd Age
D:\16\Age>javac Age.java
D:\16\Age>java Age
Enter Father's Age: 45
Enter Son's Age: 19
Father and Son age accepted
would you like to re-enter details (Y/n)
Enter Father's Age: 45
Enter Son's Age: 45
Error!: Son's age should be lesser than Father's age
would you like to re-enter details (Y/n)
Enter Father's Age: 19
Enter Son's Age: 45
Error!: Son's age should be lesser than Father's age
would you like to re-enter details (Y/n)
Enter Father's Age: 0
Enter Son's Age: 12
Error!: Son's age should be lesser than Father's age
would you like to re-enter details (Y/n)
Enter Father's Age: 0
Enter Son's Age: 0
Error!: Son's age should be lesser than Father's age
would you like to re-enter details (Y/n)
Enter Father's Age: -23
Enter Son's Age: -12
Wrong age
would you like to re-enter details (Y/n)
D:\16\Age>_
```

Multithreading

Algorithm:



```
public class Multithreading !
          public statu void mann (String () args)
             BMS bms = new BMS ();
              CSE esc = new CSE();
              bms startes;
              (se start ();
 CSE
 CSE
ISE
BMS
CSE
CSE
CSE
CSE
CSE
BNS
```

Code:

```
try {
    for(int j=0;j<15;j++) {
        System.out.println("CSE");
        Thread.sleep(2000); // Sleep for 2 seconds
    }
}
catch (InterruptedException e) {
    System.out.println("CSE Thread interrupted");
}
}

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

```
F:\Year 2\Semester 3\Object Oriented Programming in Java\Lab Class\Week 8>javac ThreadExample.java
F:\Year 2\Semester 3\Object Oriented Programming in Java\Lab Class\Week 8>java ThreadExample
BMS College of Engineering
CSE
CSE
CSE
BMS College of Engineering CSE
CSE
CSE
CSE
BMS College of Engineering
CSE
CSE
CSE
BMS College of Engineering
CSE
CSE
CSE
CSE
BMS College of Engineering CSE
CSE
CSE
CSE
CSE
F:\Year 2\Semester 3\Object Oriented Programming in Java\Lab Class\Week 8>
```

Deadlock And IPC Program

Algorithm:

Date Page	C Dot
Racing Thread entired B. bar	got: 1 Intrata Paodreu connect: 1
Momphicad entered A foo Raining Thread toying to call A las() Ansodo A last Back in other thread	Put: 2 Instructi Consmiss Geot '2 Instructi Product
Mann Muead trying to Wall 8 last () mode A last Back in mann thread.	Communed: 2
1) IPC paogram put:0 Internate Consme Paochere Wonling	34111211
Got o Indinate produce Put: P Indinate comme	
Paoduu walng Grot: 1 consmed 00	

Code:

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();
  synchronized 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();
  }
  synchronized void last() {
     System.out.println("Inside B.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);
     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();
PCFixed
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 {
```

```
Qq;
  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 {
  Qq;
  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++;
public 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.");
```

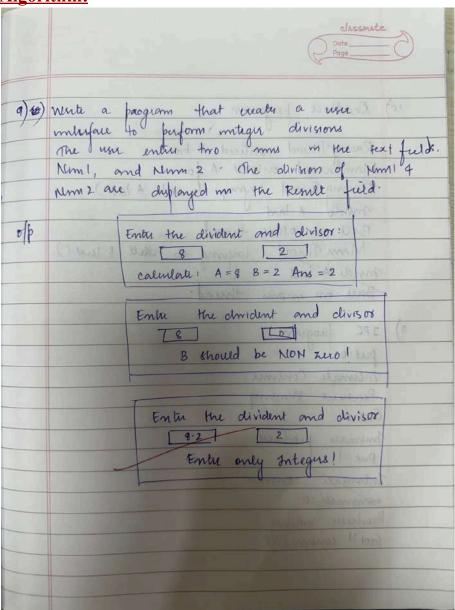
F:\Year 2\Semester 3\Object Oriented Programming in Java\Lab Class\Week 9 and 10>java PCFixed Press Control-C to stop. Put: 0 Intimate Consumer Producer waiting Got: 0 Intimate Producer Put: 1 Intimate Consumer Producer waiting Consumed: 0 Got: 1 Intimate Producer Consumed: 1 Put: 2 Intimate Consumer Producer waiting Got: 2

Intimate Producer Intimate Producer Consumed: 5 Consumed: 2 Put: 6 Put: 3 Intimate Consumer Intimate Consumer Producer waiting Producer waiting Got: 6 Got: 3 Intimate Producer Intimate Producer Consumed: 6 Consumed: 3 Put: 7 Put: 4 Intimate Consumer Intimate Consumer Producer waiting Producer waiting Got: 7 Got: 4 Intimate Producer Intimate Producer Consumed: 7 Put: 5 Put: 8 Intimate Consumer Intimate Consumer Producer waiting Producer waiting Consumed: 4 Got: 8

Got: 5

Swing Demo (Calculator)

Algorithm:



Code:

```
import javax.swing.*;
import java.awt.*;
import java.awt.event.*;
class SwingDemo {
   SwingDemo() {
```

```
// Create JFrame container
JFrame ifrm = new JFrame("Divider App");
ifrm.setSize(275, 150);
ifrm.setLayout(new FlowLayout());
// Terminate on close
jfrm.setDefaultCloseOperation(JFrame.EXIT ON CLOSE);
// Create components
JLabel jlab = new JLabel("Enter the divider and dividend:");
JTextField aitf = new JTextField(8);
JTextField bitf = new JTextField(8);
JButton button = new JButton("Calculate");
JLabel err = new JLabel();
JLabel alab = new JLabel();
JLabel blab = new JLabel();
JLabel anslab = new JLabel();
// Add components in order
ifrm.add(err); // To display errors
jfrm.add(jlab);
ifrm.add(ajtf);
jfrm.add(bjtf);
ifrm.add(button);
ifrm.add(alab);
ifrm.add(blab);
jfrm.add(anslab);
// Add ActionListeners
ActionListener l = new ActionListener() {
  public void actionPerformed(ActionEvent evt) {
     System.out.println("Action event from a text field");
};
aitf.addActionListener(1);
bjtf.addActionListener(1);
button.addActionListener(new ActionListener() {
  public void actionPerformed(ActionEvent evt) {
     try {
       int a = Integer.parseInt(aitf.getText());
       int b = Integer.parseInt(bjtf.getText());
       int ans = a / b;
       alab.setText("A = " + a);
       blab.setText("B = " + b);
       anslab.setText("Ans = " + ans);
       err.setText(""); // Clear error message
```

```
} 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 the 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();
   });
Divider App
                                      X
                             Divider App
                                                                          ×
      Enter the divider and dividend:
                                                      B should be NON-zero!
                                                  Enter the divider and dividend:
      Calculate
                   A = 8 B = 2 Ans = 4
                                                           Calculate
                             ×
Divider App
          Enter Only Integers!
     Enter the divider and dividend:
      8.2
                     1.3
              Calculate
```