# VISVESVARAYA TECHNOLOGICAL UNIVERSITY

"JnanaSangama", Belgaum -590014, Karnataka.



LAB REPORT on

# Object Oriented Java Programming (23CS3PCOOJ)

Submitted by

Aaron B Ajay (1BM23CS003)

in partial fulfilment 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 **Aaron B Ajay (1BM23CS003),** who is bonafide student of **B.M.S. College of Engineering.** It is in partial fulfilment 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.

Geetha N	Dr. Jyothi S Nayak
Assistant Professor	Professor & HOD
Department of CSE, BMSCE	Department of CSE, BMSCE

## **Index**

Sl No.	Date	Experiment Title	Page No.
1	09/10/24	Quadratic Equation Implementation	01
2	16/10/24	Student Class (SGPA Calculator)	06
3	23/10/24	Book Class (Constructors and Methods)	13
4	23/10/24	Shape Class (Abstract Class)	18
5	30/10/24	Bank Class (Inheritance)	23
6	13/11/24	Student Marks (Packages)	30
7	20/11/24	Father/Son Age Class (Exception Handling)	41
8	27/11/24	Multithreading	46
9	27/11/24	User Interface Division Calculator	49
10	27/11/24	IPC and Deadlock	55

#### **Github Link:**

https://github.com/Aronnnn1/JAVA-1BM23CS003

#### Program 1

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

6	Classes  Date Page 05	
alioley	Lab Program	
9)	Develop a Java program that prints all real solutions to the equation and that - a a little of the control of t	quadratic
	equation and that = 0. Read in a, b, c and use the gradiatic	formula.
	Ef the discriminant 62-yac is negative display a message that there are no real solutions.	staring
	Teat sournors.	
1127	Source Code / 2" , or in a street of the first street of the street of t	
	import jana. util . *.	
	Emport java-util. *; public class Quad ?	
	Scanner SC = new Scanner Et Co 1 22	
	& anner Sc = new Scanner ( System in);	
	double n, re, d-se;	
	void input () { (and 17 main ( Stime )) } } }	
	System. out. Printly (" File SP h. ) ( 1)	
	8ystem.out.println (" Enter coefficients a, b, c. ");	
To sell	b= 9c next Jut(); O share has	
0/6	c=sc-next aut ();	
G.	3	
1		-
	void calc () {	
	a d= 6*6-4xaxc;	
	if (d==0){	
	ri=-b/(2+a); , de therefore who)	
	System out prentln (" Roots are real and equal ");	
1	System. out. println ("Root 1="+r,+"InRoot 2="+00 ri);	
6463	2	
	else if CAroll dankit has love no what	
	1 1111	
	4: 5q = Hart. sqrt(6); Y, = (-b+d-sq) / (20# a);	
	92 = (b-d-sq)/(2014 a);	
	System. out. print In ("Roots are real and distinct");	
	Section, out orintly (" Root 1 = "+ 1, +" by Root 2 = "+ 1	
	System. out. println (" Root 1 = "+ r, +"In Root 2 = "+r2);	

4		
	also f a work are how the thing	of Rudge a love payram that i
or lo source	1 10 - Hath saxt (-d):	equation on that o . lead in
politale	r, = -b ((2.0 ta);	
p247 (3032	r = d-so. ((200 * a);	that these are no real colubic
	System. out. printin ("Roots are	imaginary ");
	System. out. mintln ("Root 1 = " )	rit" + "+ r2+ " " + " In Root 2 = " + T + " - " +
	r2+ "?");	( * ) Her surj Inguis
	9	White day and
	g (introdustry	Ranney St. man Seamon (1) (5)
	9	lut a b.c.d;
		daulle vi, vz, d. se;
	class Quadratic E	
	public static void main (String Quad quad = new Quad ();	g E3 args) { } D dugat box
	Ouad gread = new Quad ();	Sytemath printly ( Entry coeffice
	quadinput();	(1.124F34247.25 V
	qued.calc();	beginner Succession
	3	C-St- neek But ();
/	3	j l
		30 ola cale O.E
	Output	de beb-utake;
		3(0==6) 3)
	Enter coefficients a, b, c:	11 = - 6 (0+0);
		Bystem. out. printly (" Rect an
	5 (17 80 + " = 2 to good" + 11+	System out printle (" Rock 1="
	6	
	Roots are real and distinct	else if Carolt
	Root 1 = 2.0	des = Math. sant (d);
	Root 2 = 2.0	(cano) (co 6+ d)
	113 2 2 2 2 2	(see) ((seb-d)-cr)
		Sidem out great to ( ) facts one
	: ( set" = 5 900 not " + 1 "	System. out. printly (" Red 1 -
	AND DESCRIPTION OF THE PARTY OF	

```
Enter coefficients a, b, c:

Roots are imaginary

Root = -0.5 + 0.8660254037844386i

Enter coefficients a, b, c:

4

12

9

Root are real and equal

Root = -1.5

Root = -1.5
```

```
import java.util.*;

class Quad{
    Scanner sc=new Scanner(System.in);
    int a,b,c,d;
    double r1,r2,d_sq;

    void input(){
        System.out.println("Enter coefficients a,b,c:");
        a=sc.nextInt();
        b=sc.nextInt();
        c=sc.nextInt();
    }

    void calc(){
```

```
d=b*b-4*a*c;
    if (d==0){
       r1=-b/(2.0*a);
       System.out.println("Roots are real and equal");
       System.out.println("Root 1 = "+r1+" \setminus nRoot 2 = "+r1);
     else if(d>0){
       d_sq=Math.sqrt(d);
       r1=(-b+d_sq)/(2.0*a);
       r2=(-b-d_sq)/(2.0*a);
       System.out.println("Roots are real and distinct");
       System.out.println("Root 1 = "+r1+" \setminus nRoot 2 = "+r2);
     else{
       d_sq=Math.sqrt(-d);
       r1=-b/(2.0*a);
       r2=d_sq/(2.0*a);
       System.out.println("Roots are imaginary");
       System.out.println("Root 1 = "+r1+" + "+r2+"i"+" \setminus nRoot 2 = "+r1+" - "+r2+"i");
class Quadratic{
  public static void main(String[] args){
     System.out.println("USN: 1BM23CS003");
     System.out.println("Name: Aaron B Ajay");
     Quad quad=new Quad();
     quad.input();
     quad.calc();
  }
```

```
C:\Users\Admin\Downloads\1BM23CS003>java Quadratic
USN: 1BM23CS003
Name: Aaron B Ajay
Enter coefficients a,b,c:
Roots are real and distinct
Root 1 = -2.0
Root 2 = -3.0
C:\Users\Admin\Downloads\1BM23CS003>java Quadratic
USN: 1BM23CS003
Name: Aaron B Ajay
Enter coefficients a,b,c:
Roots are imaginary
Root 1 = -0.5 + 0.8660254037844386i
Root 2 = -0.5 - 0.8660254037844386i
C:\Users\Admin\Downloads\1BM23CS003>java Quadratic
USN: 1BM23CS003
Name: Aaron B Ajay
Enter coefficients a,b,c:
12
Roots are real and equal
Root 1 = -1.5
Root 2 = -1.5
```

Develop a Java program to create a class Student with member's usn, name, and array credits and an array marks. Include methods to accept and display details and a method to calculate SGPA of a student.

. 101	Date Page D8
Holey	Lab Programs
Q)	Develop a Java program to create a class student with member's usn,
	name, an array credits and an array marks. Suchede methods to
	accept and display details and a method to calculate sight of a student
	Source Code
	Emport java. util. »; 1332/13620 1760 1330 430- 430-
	das Subject &
	int subject Marks, credit, grade;
	Enter coefficients a, b, c.:
	void CalculateGrade(){
	if (subject Harks > = 90)
	grade = 10;
	else if (Subject-Marks >= 80)
	grade = 9;
	else if (subject Manks >= 70)
	grade = 8;
	else if (subjectHarks > = 60)
	grade=7;
	else if (subject Marks >= 50)
	grade= 6;
	else of (subject Manks > = 40)
	grade = 5;
	else
	grade =0:
	grade =0;
	9
	class Student E
	String usng, name;
	double SGPA;
	Subject subject () = new Subject (8);
	Scanner sc = new Scanner (System. in);

```
Date Page Day
void Student () {

for (it o; ic 8; i++)
     subject [i] = new Subject ();
 void Student Details ()
     System out printly ("Enter usn: "); 300 bus
      usn= = sc. next ()
       System- out printly (" Enter name: ");
      name = sc. nest();
 void get Harles () {
     for (int i=0; i(8; i++) = {
       A System-out grint (n ("Enter marks: flateage market")
          subjects li]. subject Marks = sc. next ant ();
         System. out. println ("Enter credits: ");
          subject [i] credits = 8c next Int ();
          Subjects [i]. Calculate Gade ();
       calc SGPA
   void SCRA() {
   double Score = 0 3; states
    int total_credits = 0; I have to the which will not
    for Ciuli=0; il8; 2++) [002000481 4420 1040
         Score + = subjects [i]. credits + subjects [i]. grade;
         total _ exedits + = subjects [i]. exedits;
      SGPA = Score / total - credits;
```

```
Page 10
         void display () ?
               System. out printin ("USN: "+ usn);
               System out println ("Name: "+ name);
               System-out. Println ("84PA: "+84PA);
    class Stud Details ?
        public static void anoun (string 1) args) {
              Student students [] = new Student [3];
               for (int j=0,j<3; j++) { tails for system-out.println ("Enter student" details"); +(i+1)+":");
                    Students (j] = new Student ();
                    students [ ] . get Student Details ();
                    Students CJJ-get Marks (1;
                  Shidoub [j]. SGRACL; calc SGRA();
                for (int i=0; il3; i++) &
                  students [:]. display ();
    Output:
    Enter the details for student 1:
     Enter USN: 18Mes(500)
     Enter Name: AA
     Enter marks: 99
      Enter credits: 4
      Enter marks: 98
      Enter credit: 1
                                                   Page II
Enter marks: 97
 Enter credits 4
Enter marks: 96
 Enter credits: 1
Enter marks: 78
 Enter credit: 1
 Enter marks: 86
 Enter credits: 3
 Enter marks: 90
 Enter credits: 3
 Enter marks: 91
Entracredits: 3
 USN. 115Mez (300)
Name: AA
 34PA: 9.75
```

```
import java.util.Scanner;
class Subject {
  int subjectMarks;
  int credits;
  int grade;
  void calculateGrade() {
    if (subjectMarks >= 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;
class Student {
  String usn;
  String name;
  double SGPA;
  Subject[] subjects = new Subject[8];
  Scanner sc = 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 = sc.next();
    System.out.print("Enter the Name: ");
    name = sc.next();
  }
  void getMarks() {
    for (int i = 0; i < 8; i++) {
       System.out.print("Enter marks for subject " + (i + 1) + ": ");
       subjects[i].subjectMarks = sc.nextInt();
       System.out.print("Enter credits for subject " + (i + 1) + ": ");
       subjects[i].credits = sc.nextInt();
       subjects[i].calculateGrade();
  }
  void calcSGPA() {
     double score = 0;
    int total_credits = 0;
    for (int i = 0; i < 8; i++) {
       score += (subjects[i].grade * subjects[i].credits);
       total_credits += subjects[i].credits;
    SGPA = score/total_credits;
  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) {
     System.out.println("USN: 1BM23CS003");
    System.out.println("Name: Aaron B Ajay");
    Student[] students = new Student[3];
    for (int j = 0; j < 3; j++) {
       System.out.println("Enter the details for student " + (j + 1) + ":");
```

```
students[j] = new Student();
students[j].getStudentDetails();
students[j].getMarks();
students[j].calcSGPA();
}

for (int i=0; i<8; i++) {
    students[i].display();
}
}</pre>
```

```
C:\Users\Admin\Desktop\1BM23CS003>java StudDetails
USN: 1BM23CS003
Name: Aaron B Ajay
Enter the details for student 1:
Enter the USN: 1BM23CS001
Enter the Name: AA
Enter marks for subject 1: 99
Enter credits for subject 1: 4
Enter marks for subject 2: 98
Enter credits for subject 2: 1
Enter marks for subject 3: 97
Enter credits for subject 3: 4
Enter marks for subject 4: 96
Enter credits for subject 4: 1
Enter marks for subject 5: 78
Enter credits for subject 5: 1
Enter marks for subject 6: 86
Enter credits for subject 6: 3
Enter marks for subject 7: 90
Enter credits for subject 7: 3
Enter marks for subject 8: 91
Enter credits for subject 8: 3
```

```
Enter the USN: 1BM23CS002
Enter the Name: AB
Enter marks for subject 1: 89
Enter credits for subject 1: 1
Enter marks for subject 2: 78
Enter credits for subject 2: 1
Enter marks for subject 3: 89
Enter credits for subject 3: 1
Enter marks for subject 4: 90
Enter credits for subject 4: 4
Enter marks for subject 5: 98
Enter credits for subject 5: 4
Enter marks for subject 6: 99
Enter credits for subject 6: 3
Enter marks for subject 7: 87
Enter credits for subject 7: 3
Enter marks for subject 8: 89
Enter credits for subject 8: 3
```

Enter the details for student 3: Enter the USN: 1BM23CS004 Enter the Name: AD Enter marks for subject 1: 90 Enter credits for subject 1: 4 Enter marks for subject 2: 95 Enter credits for subject 2: 4 Enter marks for subject 3: 79 Enter credits for subject 3: 1 Enter marks for subject 4: 89 Enter credits for subject 4: 1 Enter marks for subject 5: 88 Enter credits for subject 5: 1 Enter marks for subject 6: 90 Enter credits for subject 6: 3 Enter marks for subject 7: 99 Enter credits for subject 7: 3 Enter marks for subject 8: 93 Enter credits for subject 8: 3

USN: 1BM23CS001 Name: AA SGPA: 9.75 USN: 1BM23CS002 Name: AB

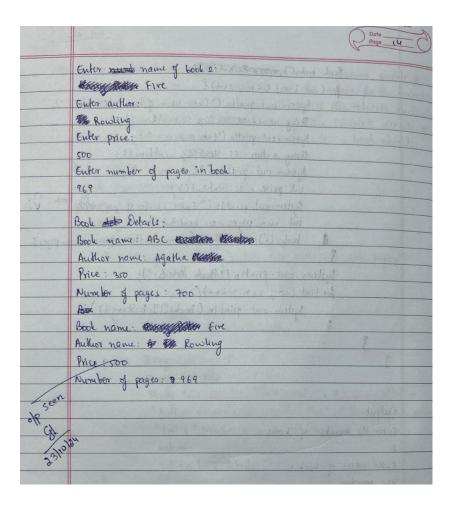
SGPA: 9.5 USN: 1BM23CS004

Name: AD SGPA: 9.8

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

23/10/24	Lat Rigram 3
0)	Greate a class Book which contains four members: name, author price num pages. Suchede a constructor to set the values for the members suchede methods to set & get the details of the objects. Suchede a tostring() method that could display the complete details of the book. Develop a java program to creat n book objects.
*	Source Code import java util. *; class Book!
	String name, author; int-price, num-pages; Book (String name, String author, int price, int num-pages)?
	this. name = name;  this. author = author;  this. price = price;  this. num_pages = num_pages;
	public 8tring to String ()?  String book_details = "Book_name: "+ His. name +" In" +
	"Author name: "+ this. author "In" + " Price: " + this price + "In" + " Number of pages: " + this. num pages + "In";
7/32	7 eturn book-details;
	class Rum f  public static void main (String E) args) &  Scanner sc = new Scanner (System.in);  System out.println ("Enter number of books: ");  int n = sc.nextInt();

	Page_L	3
900	Book books (7); war and Brook trades	
68	for (int i=0; i(n; i+1) f	
3	System out println (" Enter name of book "+ (iti) +	ч, ч).
311	String nam = somesting sc. nextline ();	,
493	System out printh ("Enter author: ");	1
	String author = sc. resetta, newthine();	
Albia de la constante de la co	System out print h ("Enter price: ");	
1000	System. out. println (" Enter number of pages the	book: ");
	int num pages = ac. next out ();	
	books liJ= new Book (name, author, price, nur	m_mages 1:
	Author nowe Agallia Marilia	1 Josh
	System out print ( "Book Details: ");	KI BUT
	for (int i=0; ien; i++) { or seed to refund	
	System out grint In (books (i.J. to String ());	
	System out grint In (books [i]. to String ());	
	Autor agent to the Residence	
3	ज्ञान भारत	
	PAR 8 copy to ordered	
0.4		2
	put	3/6
Ente	or the number of books:	40"
2		Con
	er name of book 1:	6
	Sully.	
	v author:	
U	ha Chillipp	
Ent	n price:	
350		
The second second	er number of pages in book:	
700		



```
import java.util.Scanner;
class Book {
    String name;
    String author;
    int price;
    int num_pages;
    Book(String name, String author, int price, int num_pages) {
        this.name = name;
        this.author = author;
        this.price = price;
        this.num_pages = num_pages;
    }
    public String toString() {
        String book_details = "Book name: " + this.name + "\n" +
```

```
"Author name: " + this.author + "\n" +
     "Price: " + this.price + "\n" +
    "Number of pages: " + this.num_pages + "\n";
    return book_details;
  }
}
class Run {
  public static void main(String[] args) {
     System.out.println("Name: Aaron B Ajay");
     System.out.println("USN: 1BM23CS003");
     Scanner sc = new Scanner(System.in);
    System.out.println("Enter the number of books: ");
    int n = sc.nextInt();
    Book[] books=new Book[n];
    for (int i = 0; i < n; i++) {
       System.out.println("Enter name of book " + (i + 1) + ": ");
       String name = sc.next();
       sc.nextLine();
       System.out.println("Enter author: ");
       String author = sc.next();
       sc.nextLine();
       System.out.println("Enter price: ");
       int price = sc.nextInt();
       System.out.println("Enter number of pages in book: ");
       int num_pages = sc.nextInt();
       books[i] = new Book(name, author, price, num_pages);
    System.out.println("\nBook Details:");
    for (int i=0; i< n; i++) {
       System.out.println(books[i].toString());
```

```
Name: Aaron B Ajay
USN: 1BM23CS003
Enter the number of books:
Enter name of book 1:
ABC
Enter author:
Agatha
Enter price:
Enter number of pages in book:
Enter name of book 2:
Fire
Enter author:
Rowling
Enter price:
500
Enter number of pages in book:
Enter name of book 3:
LOTR
Enter author:
Tolkein
Enter price:
680
Enter number of pages in book:
970
Book Details:
Book name: ABC
Author name: Agatha
Price: 350
Number of pages: 700
Book name: Fire
Author name: Rowling
Price: 500
Number of pages: 969
Book name: LOTR
Author name: Tolkein
Price: 680
Number of pages: 970
```

Develop a Java program to create an abstract class named Shape that contains 2 integers and an empty method named printArea(). Provide 3 classes names Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contain only the method printArea() that prints the area of the given shape.

23/10/24	Lab Programy
Q)	Develop a java program to create an abstract dass named shape that
	Contains & integers and an empty method named print Area (). Provide
	3 classes named Rectangle, Triangle and Circle such that each one
	of the classes extends the class shape Each one of the clases contain
	only the method print treal) that print the area of the given shape.
	3 Chairly line libra libra
	Source Code
	import java util +;
	abstract class Shape (
	int dinig dime;
	public shape () {
	this dime =0.
	this dimz = 0;
	public Shape (int dim, int dim) of
	this dim - dim
	this dim = dim;  this dim = dim;
	3 south & rolls & 79 Mary says aldered
	public abstract void printArea(),
	3
	class Rectangle extends shape &
	public Rectangle Cint length, int breadth) &
	public Rectangle Cint length, int breadth) {  dimi = length;  oliun = breadth;
0.20	Olun = breadtu;
1 :31 - 61	Sand Lea Herst while Athing the market
	public void printArea () ?
	jut area = dim 1 * dim 2;
	System out prutln("Area of rectangle: " + area);
(24 , ,	3 (1) as A larged has mad roll 3° ) willing describly?
	(Ohot from p = sent his

23/w/en	Lab Programy
Q)	Develop a java program to create an abstract dass named shape that
	Contains & integers and an empty method named print Area(). Provide
	3 classes named Roctangle, Triangle and Circle such that each one
	of the classes extends the class shape Each are of the classes contain
	only the method print treal) that print the area of the given shape.
	3 ( ) would be a few property of the second
	Source Code
	alched to the state of the stat
	abstract class shape &
	int diming dimin;
	Public Shape () &
	this dime =0:
	this dimz = 0; ( contemplar) short allege
	public Shape Cint dim, int dimz) of
	this dim = dim :
	this dim = dim; this dim = dim;
	3 sinds & halls & 79 May - sono allage
	g public abstract void printArea (),
	3
	class Rectangle extends shape E
	public Rectargle Cint length, int breadth) ?
	public Rectargle Cint length, int breadth) { dinc = length; dinc = breadth;
12 12 12	ount = bleann
1 231 - 64	3 A Sand Las Hard At 12 withing through 2
	public void printArea () {  int area = dim 1 * dim 2;
	Catana to manthul Area of sectantes at a area !
	System out println("Area of rectangle: " + area).
(2)	(30) of charged have send wild? ) willing how makes
	() the top is and he

```
int height = sc next Int ();

Shape briangle = new Triangle (base height);

triangle = mut head);

System out = printlin ("Enter radieus for arche: ");

int radius = new a circle (radius);

Shape arcle = new arche (radius);

circle = printlineal);

circle = printlineal)
```

```
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) {
```

```
System.out.println("USN: 1BM23CS003 \nName: Aaron B Ajay");
Scanner sc = new Scanner(System.in);
System.out.println("Enter length and width for Rectangle:");
int length = sc.nextInt();
int width = sc.nextInt();
Shape rectangle = new Rectangle(length, width);
rectangle.printArea();
System.out.println("Enter base and height for Triangle:");
int base = sc.nextInt();
int height = sc.nextInt();
Shape triangle = new Triangle(base, height);
triangle.printArea();
System.out.println("Enter radius for Circle:");
int radius = sc.nextInt();
Shape circle = new Circle(radius);
circle.printArea();
```

```
USN: 1BM23CS003
Name: Aaron B Ajay
Enter length and width for Rectangle:
10
20
Area of Rectangle: 200
Enter base and height for Triangle:
20
30
Area of Triangle: 300.0
Enter radius for Circle:
10
Area of Circle: 314.1592653589793
```

Develop a Java program to create a class Bank that maintains two kinds of accounts for its customers, one savings and one current. The savings account provides compound interest and withdrawal facilities but no cheque book facility. The current account holders should also maintain a minimum balance and if the balance falls below this level, service charge is levied. Create a class Account that stores customer name, account number and type of account. From this class, derive current account and savings account to make them more specific to their requirements. Include necessary methods to achieve the following:

- (i) Accept deposit from customer to update balance.
- (ii) Display balance
- (iii) Compute and deposit interest
- (iv) Permit withdrawal and update balance
- (v) Check for minimum balance and impose penalty if necessary

```
30/1d24
      Develop a True program to create a class bank that maintains two kinds
         of accounts for its instoners, one savings and one current. The savings
          account provides compaind subsest and withdrawal facilities but no cheque
         bode facility. The current account holders should also marriain a minimum balance and if the belance & falls below this level, the charge is level
         Create a class Account that stores customer name, account number and type
         of account from this class derive current account and savings account to
          make them more specific to their requirements. Tuchede necessary methods to
          action the following.
         (1) Accept deposit from customer to update balance
        (ii) Display balance
        (iii) Compute and deposit interest
         (in Permit withdrawal and update balance
        (V) check for minimum balance, & impose penalty if necessary
          import java uhl. *;
          class Account ?
                protected String Cust Name;
                 protected int keno;
                 protected double balance;
                 public Account (Iring Cust Name, int AccNo, double belonce)?
                    this Cust Name = Cust Name :
                    this · AccNo = AccNo;
                    this . belonce = balance; &
                  public void deposit (double 1 amount) ?
                         if (amount >0) ?
                              balance + - amount;
                               System out mutter (" Deposted; " + amount); 3
                               System out grintly ("Invalid Deposit Amount");
```

Poge 19 public void display Balance () { Sytem out pout n ( Belance : " + bolance ) . 3 class gartict extends Account ? private double interest Pate; public Sav Acel Cotting CushwerName, jut oceno, double Belance, double interest Rate) { super (Eustomer Name, accro, Balance); this interest Rate = 3 interest Rate; public void Comp Enterest Of double interest = belonce & ( set intenst Rate 100); balance + = luterest; man has all System out println (" Sukrest Added "+ Suterest); } public void withdraw (double amount) ? if (amount 1 - balance) E balance - = amount; System out poutly (" Withdrawn: "+ amount); ? System out prouter (" Susufficient Belance for withdrawal). class CurrAcct extends Account { private double minimum Balance. private double service charge; public Curract. ( String Cushmer Name, int accord, double Balance, double minimum Balance, double service dange) ! Super (Customer Name, accro, Balance). this minimum Balance = minimum Balance. this service change = service change; }

```
public and withdraw (double amount) ?
           if ( amount i = belance) [
                 belance - . amount;
                  System out protter ("withdrawn;" + amount);
                  if (belonie & minimum Bolance) f.
                         balance - = service charge ,
                       System out protty ("Service charge imposed "
                          + service charge); 3
public class Bank &
    public stelle void main (String () args)?
          Scanner sc = new Scanner (System. in);
          SanAcck SanAcc = new SanAcct ("Aaron", 123/15, 40000, +);
           Curr Acet CurrAce = new Curr Acet ("Aaron", 23 47, 10000, 50000, 500)
          System out grietly C'Choose Account Type In 1. Savings Account
           Ine Correct Account 1: ");
           int ch = sc. next But ();
           switch (ch) {
              case 1: System out printly ("Savings Account selected");
                      Sav Acc. deposit (7000);
                      Sav Ace. Comp Enterest ();
                      San Acc. withdraw (Ole (500);
                      San Acc. display Bollance ();
                      break;
            · case 2: System-act, grintly ("Current Account Solacted");
                       Currect deposit (500);
                       Curr Ace . withdraw (0000 (200);
                        Curr Ace diplay Balance ();
                        break;
```

```
default: Sylam out proten (" Turdet auce");
Choose Account Type
2 Current Account:
Savings Account Selected
Deposited 700.0
Suterest Added: 535.0
Withdrawn: 500.0
 Balance: action 10235.0
Choose Account Type
1. Savings Account
2. Current Account
Current Account selected
Deposited 800 0
Withdrawn 1000
 Balance: 10600.0
```

```
import java.util.Scanner;
```

```
class Account {
  protected String CustName;
  protected int AccNo;
  protected double balance;

public Account(String CustName, int AccNo, double balance) {
    this.CustName = CustName;
    this.AccNo = AccNo;
    this.balance = balance;
}
```

```
}
  public void deposit(double amount) {
    if (amount > 0) {
       balance += amount;
       System.out.println("Deposited: " + amount);
    else {
       System.out.println("Invalid Deposit Amount");
  }
  public void displayBalance() {
    System.out.println("Balance: " + balance);
class SavAcct extends Account {
  private double interestRate;
  public SavAcct(String customerName, int accountNumber, double balance, double interestRate) {
    super(customerName, accountNumber, balance);
    this.interestRate = interestRate;
  }
  public void computeAndDepositInterest() {
    double interest = balance * (interestRate / 100);
    balance += interest;
    System.out.println("Interest added: " + interest);
  }
  public void withdraw(double amount) {
    if (amount <= balance) {
       balance -= amount;
       System.out.println("Withdrawn: " + amount);
    else {
       System.out.println("Insufficient balance for withdrawal");
```

```
class CurAcct extends Account {
  private double minimumBalance;
  private double serviceCharge;
  public CurAcct(String customerName, int accountNumber, double balance, double
minimumBalance, double serviceCharge) {
    super(customerName, accountNumber, balance);
    this.minimumBalance = minimumBalance;
    this.serviceCharge = serviceCharge;
  }
  public void withdraw(double amount) {
    if (amount <= balance) {
      balance -= amount;
      System.out.println("Withdrawn: " + amount);
      if (balance < minimumBalance) {
         balance -= serviceCharge;
         System.out.println("Service charge imposed: " + serviceCharge);
    else {
      System.out.println("Insufficient balance for withdrawal");
public class Bank {
  public static void main(String[] args) {
       System.out.println("USN: 1BM23CS003 \nName: Aaron B Ajay");
    Scanner sc = new Scanner(System.in);
    SavAcct savAcc = new SavAcct("Aaron", 12345, 10000, 5);
    CurAcct curAcc = new CurAcct("Aaron", 12345, 10000, 5000, 500);
    System.out.println("Choose Account Type:\n1. Savings Account\n2. Current Account");
    int choice = sc.nextInt();
    switch (choice) {
      case 1:
         System.out.println("Savings Account Selected");
```

```
savAcc.deposit(700);
savAcc.computeAndDepositInterest();
savAcc.withdraw(500);
savAcc.displayBalance();
break;

case 2:
    System.out.println("Current Account Selected");
curAcc.deposit(800);
curAcc.withdraw(200);
curAcc.displayBalance();
break;

default:
    System.out.println("Invalid choice");
}
sc.close();
}
```

```
USN: 1BM23CS003
Name: Aaron B Ajay
Choose Account Type:
1. Savings Account
2. Current Account
Savings Account Selected
Deposited: 700.0
Interest added: 535.0
Withdrawn: 500.0
Balance: 10735.0
C:\Users\Asha\Desktop\Aaron\python\Lab 6 student Marks Calculation>java Bank
USN: 1BM23CS003
Name: Aaron B Ajay
Choose Account Type:
1. Savings Account
2. Current Account
Current Account Selected
Deposited: 800.0
Withdrawn: 200.0
Balance: 10600.0
```

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

Blulen	Jah Branam - 6
	Create a package Cit which has been classes - Student & Buttornals.  The class student has member like use, name, sem. The class  Student has an array  that stores the internal marks stored in five courses of the  Courrent generates of the student Create another package SEE  convents somewhat of the student is a derived class of student.  Which has the class External which is a derived class of student.  This class has an array that stores the SEE marks scored in
	This class how are array that steps the student augest the five courses of the current consents of the students are file that declarce the final marks of a students o in all fine & courses.
	Source Code
	pachage (IE; import java uhl. Scanner;
	public class Student ?  protected string usn;  protected thing name;  protected jul sem;
	public void input Student Details ( ) E { Scanner sc= new Scanner (System in);
	System out poutln ("Enter HEAT");  usn = sc. resolutation; newthine ();  System out println ("Enter name: ");
	sem = sc. next but();  sem = sc. next but();
	3

Page 13 public roid diplay Student Details () { System-out- println ("USN: "+ won); System out poutln ("Name " p + name); System out prutter ( sewester: "+ sem); package CIE; MAN + 1 import java who Coanner. public class suternals extends student & protected int[] internal Harks = new int[s]; public void injul (1 Emarly () & Sanner & = new Sammer (System in); System out prattin (" Euter Enternal Harles for 5 subjects:"); for (lut i=0; icc; i++) System out printh (" Subject "+ (i+1) +":"); internal Harby [i] = sc. newt out (); SEE/Edernals. java pachage SEE; Import CIE Enternals; Emport java tatil Scanner; public class Esternals extends Bedelit Entropals (18 protected intel see Masks = new int [5]; protected int [] final Marks = new int [s].

```
public void input SEEmasles () {
           Scanner'sc = view Scanner (System in).
            System-out. println C"Enter SEE marks for 5 subjects: 4)
            for (uti=0; (15; i++) {
                 System out-printly ("Subject "+ (in) +": ");
                 secharles [i] = sc. nextant ();
       public void calculate Final Marks () [
             for (inti=0; ilt; i++) {
                   final Karks (i) = internal Karks (i) + see Karks (i);
       public void display final Mashs () &
             display Student Details ();
             System out println ("Final Marks for 5 subject ");
              for Cint i=0; ics; i++) l
                 System out poutly ("Subject" + (i+1) +";" + (white)
import java will Scanner;
import SEE Externals;
class Hain & ?
    public static void main (String () args) {
         Scanner sc= new Scanner (System in);
          System out pout ("Enter number of shideuts: ");
          but no sc need But ();
          Externals [] some total student = now Externals [n];
```

```
Poge #
         for lind 1:0; 1c n; 1+4) {
              System out pointin ("In tutor details for student "+(E+1)+":");
              Sto students (i] = new Externals ();
              shident (i) input student Details ();
               students [i]. in put CIE marks (1;
               Students Ei]. input SEEmastes ();
               students Si). calculate final Karks ()
         System out printly ("In Final Harles of Shudents: ");
          for linti-o; con; i++) {
             System out pruth ("In Shedent" + (it) + ":");
             students [i]. duplay Final Harles (1;
Enter number of shiders: 1
Enter USN: 1BM22CS003
Enter Name: Aaron
Enter Semeter: 3
Enter Enternal Harly for 5 subjects:
Subject 1: 45
Subjects 46
Subjects: 47
subject 4: 48
 Subject 5: 49
 Enter SEE Hanks for 5 subjects:
 Subject 1; 45
 Subject 2: 46
Subject 3: 47
                                                Date Page 26
 Subject 4: 48
 Subject 5:49
 Final Mashs of Students:
  Student 1:
  USN: 1BH23C5003
  Name: Aaron
  Senester: 3
  Final Karles & for 5 subjects:
  Subject 1: 90
  Subject 2: 12
  Subject 3: 94
  Subject 4:96
 Subject 5: 98
```

```
(i) CIE/Student.java
package CIE;
import java.util.Scanner;
public class Student {
  protected String usn;
  protected String name;
  protected int sem;
  public void inputStudentDetails() {
     Scanner sc = new Scanner(System.in);
     System.out.print("Enter USN: ");
     usn = sc.nextLine();
     System.out.print("Enter Name: ");
     name = sc.nextLine();
     System.out.print("Enter Semester: ");
     sem = sc.nextInt();
  }
  public void displayStudentDetails() {
     System.out.println("USN: " + usn);
     System.out.println("Name: " + name);
     System.out.println("Semester: " + sem);
  }
}
(ii) CIE/Internals.java
package CIE;
import java.util.Scanner;
public class Internals extends Student {
  protected int[] internalMarks = new int[5];
  public void inputCIEmarks() {
     Scanner sc = 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] = sc.nextInt();
     }
(iii) SEE/Externals.java
package SEE;
import CIE.Internals;
import java.util.Scanner;
public class Externals extends Internals {
  protected int[] seeMarks = new int[5];
  protected int[] finalMarks = new int[5];
  public void inputSEEmarks() {
     Scanner sc = 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] = sc.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]);
(iv) Main function
import SEE.Externals;
```

```
import java.util.Scanner;
class Main {
  public static void main(String[] args) {
       System.out.println("USN: 1BM23CS003 \nName: Aaron B Ajay");
     Scanner sc = new Scanner(System.in);
     System.out.print("Enter number of students: ");
     int n = sc.nextInt();
     Externals[] students = new Externals[n];
     for (int i = 0; i < n; i++) {
       System.out.println("\nEnter details for student " + (i + 1) + ":");
       students[i] = new Externals();
       students[i].inputStudentDetails();
       students[i].inputCIEmarks();
       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();
```

```
USN: 1BM23CS003
Name: Aaron B Ajay
Enter number of students: 5
Enter details for student 1:
Enter USN: 1BM23CS001
Enter Name: AA
Enter Semester: 3
Enter Internal Marks for 5 subjects:
Subject 1: 45
Subject 2: 46
Subject 3: 47
Subject 4: 48
Subject 5: 49
Enter SEE Marks for 5 subjects:
Subject 1: 45
Subject 2: 46
Subject 3: 47
Subject 4: 48
Subject 5: 49
Enter details for student 2:
Enter USN: 1BM23CS002
Enter Name: AB
Enter Semester: 3
Enter Internal Marks for 5 subjects:
Subject 1: 49
Subject 2: 48
Subject 3: 47
Subject 4: 46
Subject 5: 45
Enter SEE Marks for 5 subjects:
Subject 1: 49
Subject 2: 48
Subject 3: 47
Subject 4: 46
Subject 5: 45
```

```
Enter details for student 3:
Enter USN: 1BM23CS003
Enter Name: AC
Enter Semester: 3
Enter Internal Marks for 5 subjects:
Subject 1: 41
Subject 2: 42
Subject 3: 43
Subject 4: 44
Subject 5: 45
Enter SEE Marks for 5 subjects:
Subject 1: 41
Subject 2: 42
Subject 3: 43
Subject 4: 44
Subject 5: 45
```

```
Enter details for student 4:
Enter USN: 1BM23CS004
Enter Name: AD
Enter Semester: 3
Enter Internal Marks for 5 subjects:
Subject 1: 45
Subject 2: 44
Subject 3: 43
Subject 4: 42
Subject 5: 41
Enter SEE Marks for 5 subjects:
Subject 1: 45
Subject 2: 44
Subject 3: 43
Subject 4: 42
Subject 5: 41
```

```
Enter details for student 5:
Enter USN: 1BM23CS005
Enter Name: AE
Enter Semester: 3
Enter Internal Marks for 5 subjects:
Subject 1: 43
Subject 2: 48
Subject 3: 49
Subject 4: 42
Subject 5: 47
Enter SEE Marks for 5 subjects:
Subject 1: 48
Subject 2: 49
Subject 3: 45
Subject 4: 42
Subject 5: 41
Final Marks of Students:
Student 1:
USN: 1BM23CS001
Name: AA
Semester: 3
Final Marks for 5 subjects:
Subject 1: 90
Subject 2: 92
Subject 3: 94
Subject 4: 96
Subject 5: 98
Student 2:
USN: 1BM23CS002
Name: AB
Semester: 3
Final Marks for 5 subjects:
Subject 1: 98
Subject 2: 96
Subject 3: 94
Subject 4: 92
Subject 5: 90
```

```
Student 3:
USN: 1BM23CS003
Name: AC
Semester: 3
Final Marks for 5 subjects:
Subject 1: 82
Subject 2: 84
Subject 3: 86
Subject 4: 88
Subject 5: 90
Student 4:
USN: 1BM23CS004
Name: AD
Semester: 3
Final Marks for 5 subjects:
Subject 1: 90
Subject 2: 88
Subject 3: 86
Subject 4: 84
Subject 5: 82
Student 5:
USN: 1BM23CS005
Name: AE
Semester: 3
Final Marks for 5 subjects:
Subject 1: 91
Subject 2: 97
Subject 3: 94
Subject 4: 84
Subject 5: 88
```

Write a program that demonstrates handling of exceptions in inheritance stream. Create a base class called "Father" and a derived class called "Son" which extends the base class. In class Father, implement a constructor which takes the age and throws an exception WrongAge() when the input age is less than zero. In class Son, implement a constructor that uses both Father and Son's age and throws an exception if Son's age >= Father's age.

edulan	Lab Program 7
(a)	write a program that demonstrates handling of exceptions in inhertence stream. Create a base class called "father" and a derived class called "son" which extends the base class. In class Father, inflement a constructor which takes the age of throws an exception wrong toe!) when the input age is less than on zero. In class son, implement a constructor that uses both for Father by son's age and throws an exception if son's age > = father's age
	Source Code
	day should be the format I was here do to white
	class Wronglege extends Exception?
	public wrong type (String error message) {
	super (error missae)
	3 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
	A Construction of the Many Manual of the
	(1) (1) (1) (1) (1) (1) (1) (1) (1) (1)
	class Father E
	but flogs;
	public Father (int fage) throws Wrongtge (
(0)=	throw new wronglige ("type can't be negative");
	this fage = fage:
	this f age = f-age;  System.out.println ("Father's age = "+ f-age);
	3
	class Son extends father E
	Int 8-ase:
	public Son (int f-age, int s-age) throws wrong Age ?
	super(f-age);

中人一	C roge &
and a	if (sage co) were that you down (s
1993	throw new wrong Age ("Age can't be negative");
سوادي	1 (8 906 ) 1 m/c/
1001	History new Wrong Age ("Son's age can't be greater than
Shared	or equal to Father's age"),
10000	this. s-age = s-age;
	System out print ( " sou's age " + s age):
	3
	3
	353 5000
	public class Age &
	public static void main (String[] axys){
	int fage, s-age;
	Scanner sc = new Scanner (System.in);
	System out, printin (" Enter father's age:");
	fage = msc.nestantc);
	System out- print in (" Enter son's age:");
10	s-age = wsc. next out ();
	try
	Son son = new Son (f age, s age );
	3 1 1 2 5 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
	catch & (Wrong Age err) E
	System out- point in ("Exception: "+ err get Hessage())
	3
	2 3 1 1 0 0 ps of to Mark of the worky?
	3

```
Output
       Enter father's age:
       Enter son's age:
       Exception: Son's age can't be greater than or equal to father's age
       Enter father's age
       Exception: Age can't be negative
       Exception: Age can't be negative
      Enter father's age:
       Father's age: es
       Son's age: 5 1 (++) [ 11 2] (00) +44)
Geen
```

```
Source Code
import java.util.*;

class WrongAge extends Exception{
   public WrongAge(String error_message){
      super(error_message);
   }
```

```
}
class Father{
  int f_age;
  public Father(int f_age) throws WrongAge{
    if (f_age < 0)
       throw new WrongAge("Age can't be negative");
    this.f_age=f_age;
    System.out.println("Father's age = " + f_age);
  }
}
class Son extends Father {
  int s_age;
  public Son(int f_age, int s_age) throws WrongAge {
    super(f_age);
    if (s_age < 0) {
       throw new WrongAge("Age can't be negative");
    if (s_age)=f_age) {
       throw new WrongAge("Son's age can't be greater than or equal to Father's age");
    this.s_age = s_age;
    System.out.println("Son's age: " + s_age);
public class Age {
  public static void main(String[] args) {
    System.out.println("USN: 1BM23CS003 \nName: Aaron B Ajay");
       int f_age, s_age;
       Scanner sc=new Scanner(System.in);
       System.out.println("Enter father's age: ");
       f_age=sc.nextInt();
       System.out.println("Enter son's age: ");
       s_age=sc.nextInt();
       try {
       Son son=new Son(f_age,s_age);
       catch (WrongAge err) {
```

```
System.out.println("Exception: " + err.getMessage());
}
}
```

```
C:\Users\Asha\Downloads>java Age
USN: 1BM23CS003
Name: Aaron B Ajay
Enter father's age:
Enter son's age:
Father's age = 7
Exception: Son's age can't be greater than or equal to Father's age
C:\Users\Asha\Downloads>java Age
USN: 1BM23CS003
Name: Aaron B Ajay
Enter father's age:
Enter son's age:
Exception: Age can't be negative
C:\Users\Asha\Downloads>java Age
USN: 1BM23CS003
Name: Aaron B Ajay
Enter father's age:
25
Enter son's age:
-10
Father's age = 25
Exception: Age can't be negative
C:\Users\Asha\Downloads>java Age
USN: 1BM23CS003
Name: Aaron B Ajay
Enter father's age:
25
Enter son's age:
Father's age = 25
Son's age: 5
```

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

duleu	Leb Program &
	Control - Install
01	with which creaks a threads, one thread displaying "Bus college of Engineering" once every terr seconds and another displaying "USE" once every two seconds
- 4/	"Bus college of Engineering" once every ten seconds and
	another diplaying "USE" once every two seconds
340 1	Source Code
	and the decod from the second
	class Bus extends thread {
	public void run () {
	for (int i=0; i43; i++) {  Suckey out . smith ("BM College of Engineering").
	Sucken out . sintly ("Bus allege of Engineering").
	System out println ("Bus allege of Engineering"); Thread sleep (10000);
	3
	7
The local	catch (Enterrupted Exception e) ?
	catch (Enterrupted Exception e) &  System out println ("BMS Thread Enterrupted");
	Complete the rank les was her
	3
	3
	class CSE extends Thread &
	public class void run () {
	by {
	for Cint jeo; j(15; j++) {
	System out pout in ("CE");
	Thread. sleep (2000p);
	3
	catch & (Suterrupted Exception e) E
	3 System out printlin ("CIE Thread interrupted");
	3
	3

```
public class Hultikereading ?
   public static road main (String E) args) &
    BHS bons = new BHS();
     CSE CSE = NEW CSE();
   bone start () and should not write the bluese
Output
Bus college of Engineering
CSE
CJE
CSE
Bus College of Engineering
CSE
CSE
                & said the division and divisor
CSE
CSE
Buy bottege of Engineering
CJE
CSE
CSE
CSE
```

```
class BMS extends Thread {
    public void run() {
        try {
            for(int i=0;i<3;i++) {
                 System.out.println("BMS College of Engineering");
                 Thread.sleep(10000); // Sleep for 10 seconds
            }
        }
        catch (InterruptedException e) {
            System.out.println("BMS Thread interrupted");
        }
}</pre>
```

```
class CSE extends Thread {
  public void run() {
    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) {
    System.out.println("USN: 1BM23CS003 \nName: Aaron B Ajay");
    BMS bms = new BMS();
    CSE cse = new CSE();
    bms.start();
    cse.start();
  }
}
```

```
USN: 1BM23CS003
Name: Aaron B Ajay
BMS College of Engineering
CSE
CSE
CSE
BMS College of Engineering
CSE
CSE
CSE
CSE
BMS College of Engineering
CSE
CSE
CSE
CSE
```

Write a program that creates a user interface to perform integer divisions. The user enters two numbers in the text fields, Num1 and Num2. The division of Num1 and Num2 is displayed in the result field when the divide button is clicked. If Num1 or Num2 were not an integer, the program would throw or a NumberFormatException. If Num2 were zero, the program would throw an ArithmeticException Display in a message dialog box.

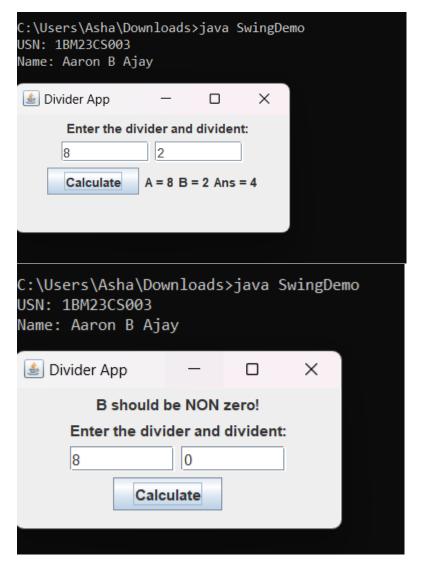
atluley	Leb Progr	au-9	4.7			Page 32
				\ pathord	HOLL MUNICIPAL	وباللاد
0)	WAP that	creates a	user	interface to peri	form juteger	divisions.
,	The use	v ist enter	1 two	numbers in the	text fields	, Numi and
	Numz.	The division	ng 1	Vumi and Num	ce us dipla	yed one in the
	result f	ield when	Hu d	ivide button is	elicked of	e Num 1 or
	Num 2	were not	an i	uteger, the prog	ram would	throw = a
	Number	format to cept	non - a	f Nums 100 w	ere xero, t	lu program
	would t	brow an	Arithm	etic Exception D	isplay the a	wa ch a
	message	e dialog b	06.			
			1 1			1 10
AND ADDRESS OF	0.1.1				W. C.	1093372
1	Output			Para,	less of English	7-17 CMS
		cuter Hu	dividen	and divident:		303
		8	1	9		363
			1	~		302
		Calculate	A=8	B=2 Ano=4	1000	3/0
Sec. 25		PARTY TO			we it Englis	Way cas
					1 1 2	500
		B she	ald be	NOW zero!		30.9
		# Euter Hu	divi	dome and divident		1.19/5
			384		Walter Street	1 33
	114	8	alestate	0		3(2)
			alculate	I when	انهد وا تدعاد	B43 64
			1000		1	33-
		Enter	Only	autegors!	-	313
		Euter Hu	divid	er and divident:		313
					MARIE	323
Section 1		8.2		2		30
		1000		-		
		(	alcula	ti	Bak o	1-101
	-	N. P. C.				Contract of the last

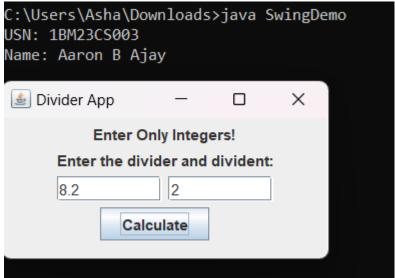
Lab Program-9	Page
	well applyage falso
	constitutional time Tital
20 modulus A soul	resident and the sales
import javar swing by	Come Lee Alex
en port java aut & x :	1993
. most java aut event. 4;	a side
class Swing Demo E	B = 1 3.05
Sving Dano Of	VENED SUE
I Frame ifrom = new I Frame ("Di	vider App");
jfrm. set size (275, 150);	Mar July 1
ifrom set layout (new Flow Layout	());
itrm. set Default Close Operation (IFro	ame. EXT_ON_CLOSE);
made Trabel flat = new Trabel (	"Enter the divider and divident:
Treatfield ajtf = new Jiest	Field(s);
Treat Field Litt - new ITent	Field(e);
JButton button = new TButto	n ("Calculate");
Jeabel en = new Jeabel ();	dre cers
Thebel aleb - new Thebell;	Control of the contro
Thatel blab = new Thatel ();	califul Chillian
Thebel ansleb = new Thebel ()	ala. dala
g frm. add (en);	10.45/4
Sfrm add (gleb);	Moun
jfrm. add (ajtf);	54-10
ifrm add (bitf);	
Ifrm add (button);	-
jfrm add (malab);	
Sfrm add (blab);	Card Pallatter Sort
jfrm add (ansleb);	
Action Listener & : new Action	
public void action Perfe	
System out - grint	In C"Action event from a test fiel
3;	our him illing

```
ajtf. add Action Lutener (1);
 bit f. add Action historier (00% (d);
 button add Action Literar Chew Action Literar O.E.
      public void achon Performed (Achienterent ext) {
             int a = Integer parce But (ajtf. get Feat (1);
             int b = Enleger. pane But (bitf. get Text ());
              int ans = alb;
              aleb-setText ("In A = "+a);
               blob-setText ("InB = "+b);
               anolab. setText ("In Aus = "+ ans);
          catch & (Number Format Exception e) &
                alab. set Text ("");
                blab. set Text (* x);
                auslab. set Text ("");
                err. set Text ("tuter Only Integers!");
           catch Chrithmetic Exception e)?
                aleb. set Text ("");
                blab. set Text ("");
                anslab. sel Teol (x").
                err. set Test (" B should be NON xero! ");
   Ifrm. set Visible (true);
public static void main (String angs (DE
   System out, printin ("USN: 18M23C8003 by Name: Aaron B gray");
     Swing applifies. Invoke Later (new Rumable () &
         public void run () {
         new Swing Demo ();
3);
```

```
import javax.swing.*;
import java.awt.*;
import java.awt.event.*;
class SwingDemo{
  SwingDemo(){
    JFrame jfrm = new JFrame("Divider App");
    ifrm.setSize(275, 150);
    jfrm.setLayout(new FlowLayout());
    jfrm.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
    JLabel jlab = new JLabel("Enter the divider and divident:");
    JTextField aitf = 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();
    ifrm.add(err);
    jfrm.add(jlab);
    jfrm.add(ajtf);
    jfrm.add(bjtf);
    jfrm.add(button);
    jfrm.add(alab);
    jfrm.add(blab);
    jfrm.add(anslab);
    ActionListener l = new ActionListener() {
       public void actionPerformed(ActionEvent evt) {
         System.out.println("Action event from a text field");
       }
     };
     ajtf.addActionListener(l);
    bjtf.addActionListener(l);
    button.addActionListener(new ActionListener() {
       public void actionPerformed(ActionEvent evt) {
         try{
            int a = Integer.parseInt(ajtf.getText());
            int b = Integer.parseInt(bjtf.getText());
            int ans = a/b;
```

```
alab.setText("\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!");
  });
  jfrm.setVisible(true);
public static void main(String args[]){
  System.out.println("USN: 1BM23CS003 \nName: Aaron B Ajay");
  SwingUtilities.invokeLater(new Runnable(){
    public void run(){
       new SwingDemo();
  });
}
```





Demonstrate Inter Process Communication (IPC) and Deadlock.

1864		CIASSM	are of
1 La		Dafe	33
2 Huley	Lab Program-10	Page	
	Tr flam - (D		
-1		Deallest.	(a
0)	Demonstrate Enter -		
	Demonstrate duter pricess Com	munication and Deadlock	
	Output	ONLY THE STREET	
	eacher	Musey thread suford to the box	
1	()	Manufaccal Engine & and E land	
+)	IRC	First A street	
	F0.1		
	Put:0	Mary of proper books and	
		Front Ashart	
	Sutinuate Consumer	Red to any Kirteed	
	Producer waiting	pole in other flored	
	yd:0		1
	Sutimate Conscioner Produc		
	Put:	er	And the second
			100 100
	Submate Consumer		21/2
	Producer waiting		6
	consumed: 0		
	Got: 1		
	Submate Producer		
	consumed: 1		
	Put: 2		
	Sutimate Conumer		
	40t:2		
	Entimale Producer		
	consumed:2		
_	Consumer waiting		
	0		
	5		1. / 2
			Page 3 34
	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \		What and com
I.	Deadlock		
	and Employee	Later green a manufaction	Bouchiele
	Mainthread entered A		
	Racing Thread entered B	· Ma har	
	at a three three t	11 0 10-1-15	Dutput
	Main thread trying to	call B. War C)	
	duvide A. last		391 (A
	RacingThread trying to	call t. (ast()	
	Puride 4. last		22 20 22
	Back in main thread		a) -E ulla
	Back in other thread		No. No. of Land
-	the in our guread	O King	December 1
			Colina
Con		Exercise Broduces	
100			1-1-0
211			1 The set 2
37		13.46 JULIUN	Fullwale C

-	Leb Program -10
_	
-	Source ande
4)	386
-	dan 98
1	Ent n;
1	bodean value Set = false; synchronized but get CIL
ı	while (!value set)
T	byl
1	System-out-prutter (*In Consumer waiting In");
	wait();
	)
	catch ( Enterrupted Exception e) (
	Catch ( Suterrupted Exception e) &  System out prod in (" Suterrupted Exception caught");
	3
	Systemout.println("(pt: "+n);
	value Set = false:
	System-out. print In ("In Surmete ProducerIn");
	notify();
	return;
	3
	Synchronized void put (int n) l
	while (value Set)
	bruf
	System. out. println (Infroducer & wasting In");
	waitg();
	8
	catch Contenueted Exception e) ?
	System-out-print by C * Suterrufted Exception caught ");
	of the first of constituted excellent (augus)

```
this. n = n;
       value set = true;
       System out prutter (Put: 4, 11);
       Systemout. pointln ("Suterrupted Consumer (n");
       notify();
class Producer implement funnable f
   09;
   Producer (QQ) E
      this. 9 = 9;
      new Threado (this, "froducer"). start ().
   public void run ()?
      int i = 0;
       while (i 415) {
          q . put (i++);
class Consumer implements Runnable &
   ap 2;
   Consumer (Dq) E
      this. q = q;
      new Thread (this, "Consumer"). start ();
   public void run () [
      int i=01
       while (icis) {
        int " = q. get ();
```

```
System out prut In ("consumed:"+ x);
           itt;
    class PCFixed [
      public detic void main (Any args ())?
          System out println L'USN: 18H23CS 003 In Name: Aaron B Gay ".
           Q q = new Q();
           new Producer (9);
           new Consumer (9);
           System out proutin (" Press Council - C to stop ");
B) Deadlock
  class AE
      synchronized void foo(Bb)?
          String name = Thread. current Thread (). get-Name ().
          System-out, printin ( "name +" entered 4. foo");
             Thread sleep (1000);
          Catch (Exception e) ?
              System out. print in (" A Tuterrapted");
           System out prutln("name + 'trying to call B. last (");
           b. last();
```

```
void last & () {
        System-out- prut In (" arride A. last");
class Bf
  synchronized void bar ( 4 a) ?
      String name = Thread current Thread () get Name ();
      System out print In (name + " entired B borr");
         Thread sleep (1000);
       catch (Exception e) ?
        System out print In (" & interrupted ");
        System out prout in C'name + trying to call 4-last ( 1);
        a last U;
    void last-C18
       System-out-print In (" Swide A. last");
class Deadlock (inflements Runnable &
    Aa= new AC);
    B b = new BU;
    Deadlock () {
       Awad- current Thread (). set Name ("Hair Thread");
        Thread t = new Thread (this, "Racing Thread");
        t-sterry (1;
        a. foo(b);
         System out printh ("Back in man Hread"),
       public void run () &
            b. bar(a);
            System out. prutter ("Back in other thread ").
       public static void main (String arys (3) ?
            System out - printin ("USN: 1BM23 (5003 In Name: Asron & Ajay").
           new Deadlock ();
```

```
(i) IPC
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);
class PCFixed {
  public static void main(String args[]) {
    System.out.println("USN: 1BM23CS003 \nName: Aaron B Ajay");
    Q q = new Q();
    new Producer(q);
    new Consumer(q);
    System.out.println("Press Control-C to stop.");
  }
}
```

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

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

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

public static void main(String args[]) {
    System.out.println("USN: 1BM23CS003 \nName: Aaron B Ajay");
    new Deadlock();
}
```

### (i) IPC

```
USN: 1BM23CS003
Name: Aaron B Ajay
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 Put: 3 Intimate Consumer Producer waiting consumed:2 Got: 3 Intimate Producer consumed:3 Put: 4 Intimate Consumer Producer waiting Got: 4 Intimate Producer consumed:4 Put: 5 Intimate Consumer Producer waiting Got: 5 Intimate Producer consumed:5 Put: 6

Intimate Consumer Producer waiting Got: 6 Intimate Producer consumed:6 Put: 7 Intimate Consumer Producer waiting Got: 7 Intimate Producer consumed:7 Put: 8 Intimate Consumer Producer waiting Got: 8 Intimate Producer consumed:8 Put: 9 Intimate Consumer Producer waiting Got: 9 Intimate Producer consumed:9

Put: 10

Intimate Consumer

Producer waiting

Got: 10

Intimate Producer

consumed:10

Put: 11

Intimate Consumer

Producer waiting

Got: 11

Intimate Producer

consumed:11

Put: 12

Intimate Consumer

Producer waiting

Got: 12

Intimate Producer

consumed:12

Put: 13

Intimate Consumer

Producer waiting

Got: 13

Intimate Producer

consumed:13

Put: 14

Intimate Consumer

Got: 14

Intimate Producer

consumed:14

## (ii) Deadlock

C:\Users\Asha\Downloads>java Deadlock

USN: 1BM23CS003 Name: Aaron B Ajay

RacingThread entered B.bar MainThread entered A.foo

MainThread trying to call B.last()

Inside A.last

RacingThread trying to call A.last()

Back in main thread

Inside A.last

Back in other thread