## VISVESVARAYA TECHNOLOGICAL UNIVERSITY

"JnanaSangama", Belgaum -590014, Karnataka.



## LAB REPORT on

# Object Oriented Java Programming (23CS3PCOOJ)

Submitted by

**Utkrisht Umang (1BM23CS355)** 

in partial fulfillment for the award of the degree of BACHELOR OF ENGINEERING

in

COMPUTER SCIENCE AND ENGINEERING



### 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 **Utkrisht Umang (1BM23CS355)**, who is bonafide student of **B.M.S. College of Engineering.** It is in partial fulfillment for the award of **Bachelor of Engineering in Computer Science and Engineering** of the Visvesvaraya Technological University, Belgaum. The Lab report has been approved as it satisfies the academic requirements in respect of an Object Oriented Java Programming (23CS3PCOOJ) work prescribed for the said degree.

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#### Github Link:

https://github.com/utk1college/OOJ\_LAB

#### Program 1

Implement Quadratic Equation

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 discriminate  $b^2$ -4ac is negative, display a message stating that there are no real solutions

Algorithm: impost Java util Scanner; public class Quadratic Osn double duc = b+b-(4+a+c); double root 1 = (-6 + Month sout (disc)/(2+a); double root 2 = (-b- Math sant ( disc System out printly ("First Rest: "+ root

. 1	
	else if (disc==0){
Hila	double root = -b/(2+a);
hal	System out privally ("Both the roots are
48.00	egral and egral to: "+ root);
s and	with a dealer of select steelessmile will
Lan VI	else & man les
	System out print ly (" There are no weat
	System. out printly ("There are no real solutions; Direnminant is negative");
The best of	2
2000	input doce ();
	3 1 To a 16-19 Scores hour state without
Service Service	4 Carlos
. /	All the same of th
	Output:
model	The guardiatic equation is: axx2 + bx + c
	Enter the coefficient a: 1
	Enter the coefficient b: 2
	Enter the conficient c: L
ALL SAFE	Both the roots one equal and equal to -1.0
	Toldred trans toward and allert
	Enter the coefficient a: 2
S You	Enter the coefficient b: 8
	Enter the coeppiaient C: 3
	Frat Rost: -0.4 1886.
	Second Rost: -3.58113
/	
	Enter the coefficient a: 4
(60.63)	Enter the coefficient 6:2
	Enter the constant C:5
	There are no real solutions; Dirmininant is
	negative

```
Code:
import java.util.Scanner;
public class QuadraticQsn {
  public static void main(String[] args) {
     Scanner sc = new Scanner(System.in);
     System.out.print("Enter coefficient a: ");
     double a = sc.nextDouble();
     System.out.print("Enter coefficient b: ");
     double b = sc.nextDouble();
     System.out.print("Enter coefficient c: ");
     double c = sc.nextDouble();
     double disc = b * b - 4 * a * c;
    if (disc > 0) {
       double root1 = (-b + Math.sqrt(disc)) / (2 * a);
       double root2 = (-b - Math.sqrt(disc)) / (2 * a);
       System.out.println("The roots are: " + root1 + " and " + root2);
     } else if (disc == 0) {
       double root = -b / (2 * a);
       System.out.println("The root is: " + root);
       System.out.println("There are no real solutions; Discriminant is negative");
     System.out.println("UTKRISHT UMANG\n1BM23ET056");
     sc.close();
  }
```

```
Enter coefficient a: 1
Enter coefficient b: 9
Enter coefficient c: 5
The roots are: -0.594875162046673 and -8.405124837953327
UTKRISHT UMANG
1BM23ET056
```

```
Enter coefficient a: 5
Enter coefficient b: 7
Enter coefficient c: 2
The roots are: -0.4 and -1.0
UTKRISHT UMANG
1BM23ET056
```

```
Enter coefficient a: 1
Enter coefficient b: 2
Enter coefficient c: 7
There are no real solutions; Discriminant is negative
UTKRISHT UMANG
1BM23ET056
```

## Program 2 Calculating SGPA

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

1 20013	import java util Gramer.
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( 1007	dose Anderst E
	String USN:
	String name, ent () credits;
-	ent Comarks;
CALLE	The state of the s
(4)	Strateut (int numbrisjects) {
	credite = new out Enumsfulgects ];
	marks = new int Commentigects ];
73	mail 3 and the control of the contro
	void accept Details () {
	Scanner sc = new Scanner (System in);
	System-out print ("Enter VIN: ");
	Isn = sc. nextline(),
	-CLASS Charles and Assessment Control of the Contro
LAGOR	System out. print (" Enter name: ");
make	Lome = sc. nextline();
	total builders entitled but t
	for (int i = 0; i < credite. length; i++) {
	Systems out print ("Enter credits for subject" + (i+1) + ":");
	subject "+ (:+1) + ":");
	[rediti [i] = sc. nextline ();
100	described the start of the star
1001-1	

```
System out print (" Enter marks for subject" + (1+1) + ": ");
    marky [:] = sc. next Int ().
void display Detaile() f
      System out pointly ("Instrudent Details:
     System out grintle ("VCN:" + ven);
     Istem put printly ("Name: "7 nome
     Cyclem out printly (" subjects, Credists,
    for (int 1= 0; i < medite laugth; i++
        Lystem. out printly ("Subject"+ (:+1)+"
        (redit = " + credite (:) +" Marks = "
        + marker (:7).
derble rationateshears
      double total Credits = 0;
      House weighted Marks = 0;
    for lint i=0; ic credite length; i++)
       int adjusted Marky = Marky [:7/10]+2.
      weighted Marks += adjusted Marks * credition
      total credity += credity [i]
     if (total Credits = = 0) 5
       return O;
     return weighted Marke / total Gredits,
```

and the same of th	Date/
problic clase main (  problic static void main (  Sconner sc=new Scanner	10116
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alphared at - New at Milliet	(agriculture)
at spatients :")	tank a
System out print ("Enter- of subjects:"); "It rumship ects = sc.	rextant().
and a share of the later of the sales	and the last
. Student student = new St	udent (numbrigat)
student accept Detaile(), student display Detaile	and a
student display Dotai les	0;
System out printly (An SG sc. close C);	lemates GRAL);
System Out printly Can Str	PA: "+ sgpa);
sc. close ();	
2	
A A A A A	
11 Ordent	
Enter the number of subject: 5	
Enter USN: 1BM23 CS 1111	
Enter name: Jason	
Enter credits for subject 1: 4	
Enter mark for subject 1: 93	
Enter marks for entject 2: 4	
Enter credity for subject 13: 3	
Enter marks for subject 3: 95	
Enter credits for subject 4: 3	
Enter marks for subject 4: 77	
Futer andib for subjects: 1	
Enter marke for subject 5: 86	100
SGPA: 9.267	
9/19/11	
- Alle	199

#### Code:

```
import java.util.Scanner;
class Student {
  private String usn;
  private String name;
  private int[] credits;
  private int[] marks;
  public void acceptDetails() {
    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 the number of subjects: ");
    int numSubjects = sc.nextInt();
    credits = new int[numSubjects];
    marks = new int[numSubjects];
    for (int i = 0; i < numSubjects; i++) {
       System.out.print("Enter credits for subject " + (i + 1) + ": ");
       credits[i] = sc.nextInt();
       System.out.print("Enter marks for subject " + (i + 1) + ": ");
       marks[i] = sc.nextInt();
    sc.close();
  }
  public void displayDetails() {
    System.out.println("USN: " + usn);
     System.out.println("Name: " + name);
    System.out.println("Subject-wise details:");
    for (int i = 0; i < \text{credits.length}; i++) {
       System.out.println("Subject " + (i + 1) + " - Credits: " + credits[i] + ", Marks: " + marks[i]);
  }
  public double calculateSGPA() {
```

```
double weightedMarks = 0;
    int totalCredits = 0;
    for (int i = 0; i < credits.length; i++) {
       double adjustedMarks = marks[i] / 10.0 + 1;
       weightedMarks += adjustedMarks * credits[i];
       totalCredits += credits[i];
    return weightedMarks / totalCredits;
}
public class Main {
  public static void main(String[] args) {
    Student student = new Student();
    student.acceptDetails();
    student.displayDetails();
    double sgpa = student.calculateSGPA();
    System.out.printf("SGPA: %.2f%n", sgpa);
    System.out.println("UTKRISHT UMANG\n1BM23ET056");
  }
}
```

```
Enter USN: 1BM23CS1111
Enter Name: Utkrisht
Enter the number of subjects: 5
Enter credits for subject 1: 4
Enter marks for subject 1: 93
Enter credits for subject 2: 4
Enter marks for subject 2: 89
Enter credits for subject 3: 3
Enter marks for subject 3: 95
Enter credits for subject 4: 3
Enter marks for subject 4: 77
Enter credits for subject 5: 1
Enter marks for subject 5: 86
USN: 1BM23CS1111
Name: Utkrisht
Subject-wise details:
Subject 1 - Credits: 4, Marks: 93
Subject 2 - Credits: 4, Marks: 89
Subject 3 - Credits: 3, Marks: 95
Subject 4 - Credits: 3, Marks: 77
Subject 5 - Credits: 1, Marks: 86
SGPA: 9.87
UTKRISHT UMANG
1BM23ET056
```

#### **Book Details**

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

Algorithm: ava. util. scommen

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The state of the s
The Cardad Coon : 1900 [ ] 1800
public void set Name (String name)
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The state of the s
public void set Anthon (String anthon) { this anthron = anthron
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this price price
public vold set Numbages ( Fort numbages) {  His mulages - numbages,
this mulages - numbages.
3
public stong tostring Of
public string tostring Of return "Book Name: "+ name + " \n"+
"Author:" + muthon + " \n"+
"Price: 18"+ price + "\n"+
"Number of lages: "Inmlages,
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6	inblir close Beakstores
1	public static void main (String (7 are)
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1	agentime unit that the minhor of how
	rut no scanner next Int ()
	scommer nentline ();
15 18	
- 3	Books ] books = new Book [n];
-	mesors can be to see that Is a State of Addition
	for (int 1=0; i < n; 8++) {
	tystem out pointly ("In Enter details for
VIII O	Rt 0k " + (i+1) + (:").
	System put print ("Name");
	fittemname = scormer nextline().
	= = = = = = = = = = = = = = = = = = =
	string outhor = sommen-nextline()
	typtem out point ("frice.").
21.000	double price sconnernent Double()
	System - out-print ("Number of Pages:").
	"int unulager = scourner next Int ();
	Janen northnell
	kroke [i] - new book (name, nother,
No. 1	? price, mulages),
94	7
	Lustine and advette (11) Roote Dolais 1.11)
_	for (int i=0; ixn; E++) f
pleed	System : part printle ("no Book" co. 12 " notate
/	System and println ("InBook", (i+12, "Details) System and println (backs (i) to strings)
	3 Carrie Carrie Color Co
	2

#### Code:

import java.util.Scanner;

```
class Book {
  private String name;
  private String author;
  private double price;
  private int num_pages;

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

```
this.num_pages = num_pages;
  }
  public void setDetails(String name, String author, double price, int num_pages) {
     this.name = name;
     this.author = author;
     this.price = price;
     this.num_pages = num_pages;
  }
  public String getDetails() {
     return "Name: " + name + ", Author: " + author + ", Price: " + price + ", Pages: " + num_pages;
  @Override
  public String toString() {
     return "Book Details:\n" +
          "Name: " + name + "\n" +
          "Author: " + author + "\setminusn" +
          "Price: " + price + "\n" +
          "Number of Pages: " + num_pages;
public class BookStore {
  public static void main(String[] args) {
     Scanner sc = new Scanner(System.in);
     System.out.print("Enter the number of books: ");
     int n = sc.nextInt();
     sc.nextLine(); // Consume the leftover newline
     Book[] books = new Book[n];
     for (int i = 0; i < n; i++) {
       System.out.println("Enter details for book " + (i + 1) + ":");
       System.out.print("Name: ");
       String name = sc.nextLine();
       System.out.print("Author: ");
       String author = sc.nextLine();
       System.out.print("Price: ");
       double price = sc.nextDouble();
       System.out.print("Number of Pages: ");
       int num_pages = sc.nextInt();
       sc.nextLine(); // Consume the leftover newline
       books[i] = new Book(name, author, price, num_pages);
```

```
System.out.println("\n--- Book Details ---");
    for (int i = 0; i < n; i++) {
      System.out.println(books[i].toString());
    System.out.println("UTKRISHT UMANG\n1BM23ET056");
  }
}
```

```
Enter the number of books: 2
Enter details for book 1:
Name: Java Programming
Author: Sasha Smith
Price: 550
Number of Pages: 990
Enter details for book 2:
Name: Mathematics in Coding
Author: Will Watson
Price: 450
Number of Pages: 800
--- Book Details ---
Book Details:
Name: Java Programming
Author: Sasha Smith
Price: 550.0
Number of Pages: 990
Book Details:
Name: Mathematics in Coding
Author: Will Watson
Price: 450.0
Number of Pages: 800
UTKRISHT UMAÑG
1BM23ET056
```

Abstract Class Shape

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

Algorithm
abstract class sharpel
int dimensione, dimensione
abstract void printArea();
2 ones we will
Jack Sapar of the Anna Francis A
class Rectangle extends shape?
Cloud Rectangle extends shape { Rectangle (int length, int midth) {
Nimersion 1 = derigth;
dimenson 2 = wiath;
4
Void print Area () { Sylveni. out. print ("Area of Roctangle: (dimension 1 * dimension 2)),
Speri. Out. frintln ("Area of Koctangle:
2 (d'inemicu 1 + d'inemicu 2)),
2.1
Mus Triangle extends Chans C
Inaugle extends Shape & Inaugle (int base, int height) { dimension   = base;
d'inquien 1 = base;
2 dimension 2 = herght;
3

voidpoint Area () {
System out print In ( Area of Triange
+ (0.5+ dimensions + dimensions
John Beller less promotions de not
through the action and the design
dose Circle extends shape &
Circle Out routing &
diviension 1 = gadins;
dimension 2 = 0; out 4:
3 standard a sensita confinence of
void prutacea () for a storal
System out println ("Area of Circle"
(Morth PI * dimension f * dimenson)
Comment of source of the source of the make
where we minister is whealt she will any will a make the will the
as long of shouthern your print got a good to
public done mail (
public static void main (strang [] angest
Shape ro dongle = new Rectougle 15.10
Shape trangle - now triangle (6,8);
Shope Circle-neu Circle (7);
A stabanillaria hotera de atrica estima la cheri
rectangle privil Area ()
trangle point Area (),
and mutter a,
2
11 Tratorate
11 Compression of the contract
Anoa of Rectangle: 50
Are a pt Triguegle: 24.0
Area of Circle: 153.93804002589985

```
Code:
import java.util.Scanner;
abstract class Shape {
  int dimension1;
  int dimension2;
  abstract void printArea();
}
class Rectangle extends Shape {
  Rectangle(int length, int breadth) {
     this.dimension1 = length;
     this.dimension2 = breadth;
  }
  @Override
  void printArea() {
    System.out.println("Area of Rectangle: " + (dimension1 * dimension2));
  }
}
class Triangle extends Shape {
  Triangle(int base, int height) {
     this.dimension1 = base;
     this.dimension2 = height;
  @Override
  void printArea() {
    System.out.println("Area of Triangle: " + (0.5 * dimension1 * dimension2));
  }
}
class Circle extends Shape {
  Circle(int radius) {
     this.dimension1 = radius;
  }
  @Override
  void printArea() {
    System.out.println("Area of Circle: " + (Math.PI * dimension1 * dimension1));
  }
}
public class Main {
  public static void main(String[] args) {
```

```
Scanner sc = new Scanner(System.in);
     System.out.print("Enter length and breadth of rectangle: ");
    int length = sc.nextInt();
    int breadth = sc.nextInt();
     Shape rectangle = new Rectangle(length, breadth);
    System.out.print("Enter base and height of triangle: ");
    int base = sc.nextInt();
    int height = sc.nextInt();
    Shape triangle = new Triangle(base, height);
    System.out.print("Enter radius of circle: ");
    int radius = sc.nextInt();
     Shape circle = new Circle(radius);
    System.out.println();
    rectangle.printArea();
    triangle.printArea();
    circle.printArea();
    System.out.println("UTKRISHT UMANG\n1BM23ET056");
    sc.close();
}
```

```
Enter length and breadth of rectangle: 5 10
Enter base and height of triangle: 6 8
Enter radius of circle: 7

Area of Rectangle: 50
Area of Triangle: 24.0
Area of Circle: 153.93804002589985
UTKRISHT UMANG
1BM23ET056
```

Bank Details

Develop a Java program to create a class Bank that maintains two kinds of account for its customers, one called savings account and the other current account. The savings account provides compound interest and withdrawal facilities but no cheque book facility. The current account provides cheque book facility but no interest. Current account holders should also maintain a minimum balance and if the balance falls below this level, a service charge is imposed.

Create a class Account that stores customer name, account number and type of account. From this derive the classes Cur-acct and Sav-acct to make them more specific to their requirements. Include the necessary methods in order to achieve the following tasks:

- a) Accept deposit from customer and update the balance.
- b) Display the balance.
- c) Compute and deposit interest

Permit withdrawal and update the balance Check for the minimum balance, impose penalty if necessary and update the balance.

Algorithm:

	import jara. util- Scanner; Page
	class Account (
1960	String austamer Name;
	int account Number;
11	dentile balance,
	Chamber of a cold for I form the
	Account (String constance Name, int accountdu
	delibre borrance) ( -mber
	this oustomer Name = customer Name,
	this account Number = account Number
	this balance = balance;
	void displaybalance ()5
MANA	void display & alonce () {  Aystern out println ("Account holder:"+
10mm	[MATIMEUN OWNE ].
	System ant println ("Account Number:"+
75	Diennit Number 1.
1	Aystem out printly ("Bolance:" + bolance);
	3 Aystern erst printle ("Bollmee:" + kolonie);
	unid demosit (double amount) 5
39	void deposit (double amount) { balance += amount;
350	Cutous went neighbor ("Aspert tod "immount)
1	System ent. printle ("Seported: "+ amount);
	3
- 2	Talkey but might to the first swife of all hours?
	class SovAcct extends Account ?
	plantele interestRorte = 0.05;
-	tuestal district and and the
	Sav Acct (String automen Name, int account Number.
	double kalance) f
	super ( outomer Norme, account Number,
37	balance);
-	1 4

void compute Interest () f
double interest = bolonce * interest Rate.
balance += interect;
System ant println ("Interest rolled:"
1 Lubough )
3 market parties and the same of the same
de Achardende de la
class CurAcct extends Account of
double minimum Balance = 500;
double penalty = 50;
The state of the s
CurAcct (String cretomen Name, int
account Number, double balance
super (contomer Name, account Number
kalamee),
Consideration of the second of the second
void withdram (double amount) {
if (kalance >= amount) {
balance -= amount;
System out printin ("Withdraum
+ amount),
J thee?
Lystem out println ("Insufficient balance!");
balance 1 2;
23
20.0 = shall surely about
take and by a solar of a solar of

public dass Bank {  problic static void main (String [] args) {  Scanner sc = new Scanner (System.in),
proble states void main (ching [7 mas)
Comesey sc - man commen Christem in)
Junited Ses Men Junited Logs
Contenu and a sat C' C de anno for
System out print ("Enter name for
Savinge Account: ");
String name: scinextline();
System out print (" Enter account number).
ixt account = sc. next ant();
System ont print ("Enter initial balance: ?.
danble balance = sc next Double ();
Javacet sarings = new SavAcct (name, accNum,
balance).
somings display Bolonie ().
somings display Borlance (); somings computed nterest (); somings display Borlance ();
savings. display Balance (2)
Corona surroundina.
System Text - privather "In Enter norme for
System out privalle ("In Enter name for Current Account:");
SC. NextLine ():
String name Cur = sc. nextline(),
System out printer ("Enter account Number:").
int acc Num Cr = Sc. next Iine();
System ent print ("Enter initial balance:).  dande kalance (nr = sc next Double).
Euracet current = new Curacet (nome Cur, accolumbus, balanda).
twithest printing new chineses was the state of
Current display Bollance ();
current check Minimum Balance ();
current deposit (200);
current mithdraw (100);
current display Borlance ();
sc. dese();
3

-		Date
11	Ontput:	ilia i
2 (vary)	Enter name for Savings Account:	Bob
Jeten in	Enter account number: 101	
	Enter initial balance: 1000	18011
fax	Accumut Holder: Bob	
13 (1	Account Number: 101	
	Bolance: 1000.0.	
number	Interest Added = 50.0	
	Account Holder: 806	500
bolower	Account Number: 101	
()	Bolance: 1050.0.	
	Contract the many than the second	and the
ocenhan	Enten name pour Current Accom	ot: Shea
	Enter account number: 102	Most Billians
	Enter initial balance: 400	
	Account Nymber: 102	
	Account Holder: Shea	Carl III
	Bolance: 400.0	
JAN 1	Penalty Emposed: 50.0	
	Deposited ! 200.0	B. B. Sauce
	Withdraum: 100.0	
	Account Holder: Shea	
hundren	Account Number: 102	SWILL SELL
	Balance: 450.0	=1-1:
dy	Martin - road print (" Catter water 18	THE RES
Morris	14 tx 954 - 22 - MAN IS PRINTED IN A SHOWN	

#### Code:

```
import java.util.Scanner;
class Account {
  String customerName;
  String accountNumber;
  String accountType;
  double balance;
  Account(String customerName, String accountNumber, String accountType, double balance) {
    this.customerName = customerName;
    this.accountNumber = accountNumber;
    this.accountType = accountType;
    this.balance = balance:
  }
  void deposit(double amount) {
    balance += amount;
  }
  void displayBalance() {
    System.out.println("Balance: " + balance);
}
class SavAcct extends Account {
  private static final double INTEREST_RATE = 0.05;
  SavAcct(String customerName, String accountNumber, double balance) {
    super(customerName, accountNumber, "Savings", balance);
  }
  void computeAndDepositInterest() {
    double interest = balance * INTEREST_RATE;
    balance += interest;
    System.out.println("Interest added: " + interest);
  }
  void withdraw(double amount) {
    if (amount <= balance) {
       balance -= amount;
       System.out.println("Amount withdrawn successfully.");
    } else {
       System.out.println("Insufficient balance for withdrawal.");
  }
```

```
}
class CurAcct extends Account {
  private static final double MINIMUM_BALANCE = 1000;
  private static final double PENALTY = 100;
  CurAcct(String customerName, String accountNumber, double balance) {
    super(customerName, accountNumber, "Current", balance);
  }
  void withdraw(double amount) {
    if (amount <= balance) {
       balance -= amount;
       if (balance < MINIMUM_BALANCE) {
         balance -= PENALTY:
         System.out.println("Penalty imposed: " + PENALTY);
       System.out.println("Amount withdrawn successfully.");
     } else {
       System.out.println("Insufficient balance for withdrawal.");
  }
  void deposit(double amount) {
    balance += amount;
    System.out.println("Amount deposited: " + amount);
}
public class Bank {
  public static void main(String[] args) {
    Scanner sc = new Scanner(System.in);
    System.out.println("Savings Account");
    System.out.print("Enter account holder name: ");
    String savName = sc.nextLine();
    System.out.print("Enter account number: ");
    String savAccNo = sc.nextLine();
    System.out.print("Enter initial balance: ");
    double savBalance = sc.nextDouble();
    SavAcct savingsAccount = new SavAcct(savName, savAccNo, savBalance);
    System.out.println("Account Holder: " + savingsAccount.customerName);
    System.out.println("Account Number: " + savingsAccount.accountNumber);
    System.out.println("Balance: " + savingsAccount.balance);
    savingsAccount.computeAndDepositInterest();
    System.out.println("Account Holder: " + savingsAccount.customerName);
```

```
System.out.println("Account Number: " + savingsAccount.accountNumber);
System.out.println("Balance: " + savingsAccount.balance);
System.out.println("\nCurrent Account");
sc.nextLine();
System.out.print("Enter account holder name: ");
String curName = sc.nextLine();
System.out.print("Enter account number: ");
String curAccNo = sc.nextLine();
System.out.print("Enter initial balance: ");
double curBalance = sc.nextDouble();
CurAcct currentAccount = new CurAcct(curName, curAccNo, curBalance);
System.out.println("Account Holder: " + currentAccount.customerName);
System.out.println("Account Number: " + currentAccount.accountNumber);
System.out.println("Balance: " + currentAccount.balance);
System.out.print("Enter amount to withdraw: ");
double withdrawAmount = sc.nextDouble();
currentAccount.withdraw(withdrawAmount);
System.out.print("Enter amount to deposit: ");
double depositAmount = sc.nextDouble();
currentAccount.deposit(depositAmount);
System.out.println("Account Holder: " + currentAccount.customerName);
System.out.println("Account Number: " + currentAccount.accountNumber);
System.out.println("Balance: " + currentAccount.balance);
System.out.println("\nUTKRISHT UMANG\n1BM23ET056");
sc.close();
```

}

Savings Account Enter account holder name: Bob Enter account number: 101 Enter initial balance: 1000 Account Holder: Bob Account Number: 101 Balance: 1000.0 Interest added: 50.0 Account Holder: Bob Account Number: 101 Balance: 1050.0 Current Account Enter account holder name: Shea Enter account number: 102 Enter initial balance: 400 Account Holder: Shea Account Number: 102 Balance: 400.0 Enter amount to withdraw: 100 Penalty imposed: 100.0 Amount withdrawn successfully. Enter amount to deposit: 200 Amount deposited: 200.0 Account Holder: Shea Account Number: 102 Balance: 400.0 UTKRISHT UMANG 1BM23ET056

#### Packages

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

#### Algorithm:

pachage CIE;
public dass Student
¿ public stong usn;
public string name,
public int elm; f
public Student (String usn, String name, int
sim)
f this usw = usw;
this name = name;
this sum = sum; 3
public void display Student Details ()
{ system out pointlin ("USN!" + USN);
System out println ("Name:" + name);
System out minthe ("Sum: "+ sum).
3 System out println ("Sum: "+ sum);
2

-	public dass Internals  E public fut CJ Internal Marks = new int [5]
11	public class Internal Marke = new int [5]
ah :	¿ public fut is distributed
wa	1 1 1 2 day of sacrety ( tate 7 may)
17.	public void set Internal Manks (int E) marks [  { for (int i=0; i < 5; i++)
eter	¿ for ( int i=0; ( = 3; (++)
17 30	{ internal Marike [i] = marker [i];
. Jane	fintamalmanke [:] = manke [:];
la es	Marte market or and the stock!
100	Lie word Lucialan Junton Contract
4 4	I sustem out printly (" Internal marker"
1	for but i=0; i < Internal Marika bength; ite
. In .	f system and printly ("Internal Marke;")  for (jut i = 0; i < Internal Marke bength; its  f system and printly (internal Marketi);")
LOS I	The state of the s
	Julian and printlate and and
130.20	3 system out println();
-	2
	-x
	Anthorn well wilder
	package SEE;
	package SEE; import CIE.*;
	The County of th
	public class External extends Student
	¿ problic int [] set Marks = new int (5);
20	public External (String us, string name,
300	int sems
	& Anger (un, name, sem);
11	Man 2014 Annual Parts Man Saidea
150	public void set SEE manks (int C) masky
22	101
	f tor (int i=0; :<5; i++)
	2 f set manks [i] = manks [i];
	2
	3

1 Ugu	
problec void display seemants ()	
I system out with ("SEE manks: ")	
Expeten out printly ("SEE Manks: "), for (int i= 0; i < set manus length (); i+	+)
Lystem out prent lu Membs C: It	")
Taga ora mor para un crassas o si	
system part ment ()	
3 System out prently();	
3	
Landing CID and the tendent of the contract of	
import CIE. *.	
Insport SEE. *	
Emport java util Scanner;	
problèc class main {	
public static void main (string[] args)	
1 Scanney sc - new Scanney Consterning	2
System out privath ("Enter no of studes	di:
gut n=sc. next Int ();	
External [] Students = new External	N,
Internals [] "uternals - new Internal	
Chalanter 3 & Dugland College	
for (+ut := 0; i < n; i++)	
I system out privat la ("In Enter details	
of the student: ");	
System out printly ("Enter USN:"	2.
String usn = sc nextline();	
Pyston out println ("Enter name: ")	-
String name = sc. nentlinel);	
System out printly (" Enter sum:	2:
int som= sic nextOnt (),	-
- Company days without	

Students Ci J = new External (USW, name, sem Internale [:] = now Internals []. System out println ("Enter 5 internal many int [] intermal Marke = new int (5); for (int = 0; j < 5; j++) f intermalmanks [] ] - Sc neatonto. internals (i) set Internal Marches Continues Marks) System out println ("Enter 5 SEE marks) int [] SEE Maryes = nens Int [5]. for (int j=0; 1<5; 9++) } SEE Manhs [j] = Si ment got (); ? Student [i]. Set SEEManks (SEEMan) System ant println ("in final mark of Student" for (Int i=0; ixn; i++)\$ System out printly "In Student" + (i+1)+": students [i] displaystudent Details internals [: ]. display Internal Marks () strolents D. display ( SEE Moules (); System out pointln ("Final Marke:") for (int j=0; j<5; j++)

fint final Marks = internals [i] internal Mariles [i] + (students [i]. SEEMANG []]/2); system out print ("Final marke +"") Lystem out println();

	Output:
Land !	Enter number of strelents: 1
W	Enter USN: JBM23CSOOL
Abi	Enter Name: Jack
MAN	Enter SEM: 3
NO	Enter 5 Internal marks
	20 25 18 23 20
194	Enter 5 SEE marks:
10.4	50 55 40 45 35
	as I trembly that use both faither be
-	Student 1:
	USN: 1BM23CS001 Name: Jack
	Semesten: 3
b) and how	Internal Marily: 20, 25, 18, 23, 20
);	SEE May 50, 55, 40, 45, 35.
	Final Manue: 45, 52, 38, 45, 37.
7	Carlowiscon La Donnia de

```
Code:
package CIE;
public class Student {
  protected String usn;
  protected String name;
  protected int sem;
  public Student(String usn, String name, int sem) {
     this.usn = usn;
     this.name = name;
     this.sem = sem;
  }
  public void displayPersonalDetails() {
     System.out.println("USN: " + usn);
     System.out.println("Name: " + name);
     System.out.println("Semester: " + sem);
  }
package CIE;
public class Internals extends Student {
  private int[] internalMarks = new int[5];
  public Internals(String usn, String name, int sem, int[] internalMarks) {
     super(usn, name, sem);
     this.internalMarks = internalMarks;
  }
  public void displayInternalMarks() {
     System.out.println("Internal Marks:");
     for (int i = 0; i < internalMarks.length; <math>i++) {
       System.out.println("Course" + (i + 1) + ":" + internalMarks[i]);
  }
package SEE;
import CIE.Student;
public class External extends Student {
```

private int[] externalMarks = new int[5];

```
public External(String usn, String name, int sem, int[] externalMarks) {
     super(usn, name, sem);
     this.externalMarks = externalMarks;
  }
  public void displayExternalMarks() {
     System.out.println("External Marks:");
     for (int i = 0; i < \text{externalMarks.length}; i++) {
       System.out.println("Course" + (i + 1) + ":" + externalMarks[i]);
}
import CIE.Internals;
import SEE.External;
import java.util.Scanner;
public class Main {
  public static void main(String[] args) {
     Scanner sc = new Scanner(System.in);
     System.out.print("Enter the number of students: ");
     int n = sc.nextInt();
     sc.nextLine(); // Consume newline
     Internals[] internals = new Internals[n];
     External[] externals = new External[n];
     for (int i = 0; i < n; i++) {
       System.out.println("\nEnter details for Student " + (i + 1));
       System.out.print("USN: ");
       String usn = sc.nextLine();
       System.out.print("Name: ");
       String name = sc.nextLine();
       System.out.print("Semester: ");
       int sem = sc.nextInt();
       sc.nextLine(); // Consume newline
       System.out.println("Enter Internal Marks (5 courses): ");
       int[] internalMarks = new int[5];
       for (int j = 0; j < 5; j++) {
          internalMarks[i] = sc.nextInt();
       }
       internals[i] = new Internals(usn, name, sem, internalMarks);
       System.out.println("Enter External Marks (5 courses): ");
```

```
int[] \ externalMarks = new \ int[5]; \\ for \ (int \ j = 0; \ j < 5; \ j++) \ \{ \\ externalMarks[j] = sc.nextInt(); \\ \} \\ sc.nextLine(); // \ Consume \ newline \\ externals[i] = new \ External(usn, name, sem, externalMarks); \\ \} \\ System.out.println("\nStudent Details:"); \\ for \ (int \ i = 0; \ i < n; \ i++) \ \{ \\ internals[i].displayPersonalDetails(); \\ internals[i].displayInternalMarks(); \\ externals[i].displayExternalMarks(); \\ system.out.println(); \\ \} \\ System.out.println("UTKRISHT UMANG\n1BM23ET056"); \\ sc.close(); \\ \} \\
```

```
Enter the number of students: 1
Enter details for Student 1
USN: 1BM23CS001
Name: Jack
Semester: 3
Enter Internal Marks (5 courses):
20 25 18 23 20
Enter External Marks (5 courses):
50 55 40 45 35
Student Details:
USN: 1BM23CS001
Name: Jack
Semester: 3
Internal Marks:
Course 1: 20
Course 2: 25
Course 3: 18
Course 4: 23
Course 5: 20
External Marks:
Course 1: 50
Course 2: 55
Course 3: 40
Course 4: 45
Course 5: 35
UTKRISHT UMANG
1BM23ET056
```

## **Exception Handling**

Write a program that demonstrates handling of exceptions in inheritance tree. Create a base class called "Father" and derived class called "Son" which extends the base class. In Father class, implement a constructor which takes the age and throws the exception WrongAge() when the input age<0. In Son class, implement a constructor that uses both father and son's age and throws an exception if son's age is >=father's age.

# Algorithm:

	impout java util Acanney:
	class WrongAge Exception extends Exception
	I public wrong Age Exception (String
	ders WrongAge Exception extends Exception Epiklic WrongAge Exception (String message)
	E super (message);
	4
	4
	class pather {
70	public int age:
	public Father [int age) throngs Wrong Age Exception {
	Wrong Age Exceptions
	if (dge < 0)
	throw new wrong Age Exception
	("Fother age cannot be negative) this. age = age:
	this age = age;
	System out println ("Agge set
	System. out println ("Agge set
	3
	)

	Date
dos son extends father	Austina
{ private intrange;	A SULVE HEROID
public son (int father Ange	; int Songe) throus.
Wrong Aage Exception	2,100
{ super (forther Age)	- Hopens
if (sonage < b)	
throng new Wron	gage Exception ("Son-
- Land of the college of the college of	age can't be negative; }-
if (Son Angez = +	ortherAge)
throw new wron	gAge Exception ("Son-
age cannot	be greater tramore.
equal to fate	ner age");
this : SonAge = s	onogei -
System out printly	("Jons age is set to:
7	+ this sonage),
7 3	
Lio dou ora: C	A PLANT OF BUILDINGS
public class Main {	1.052) [
1500000 10 - 1000 C	nugl Jargs 1
problec static void main (St. Scanner sc = new So	unner (system vi);
Le M	
int jathenAge = s  system out printle	constant of
witer out printly	("Enter Ami'd noe:")
int sonAge = sc x	rent Int ();
Son son= new Son	(futher Age, son Age)
catch [Wrong Age Exce	yetion e)
catch (Wrong Age Exce { System ent println(	"Exception: "+ e. gotM.
3	-eslege);
cotch (Exception	e)
{ System ont prin	e) thn("Error" + e.get monegel),
J	moringely,
3 3	

```
Enter fortheris age: 50.

Enter Son's age: 25.

Exception Fortheris age comnot be negative.
```

```
import java.util.Scanner;
class WrongAgeException extends Exception {
  public WrongAgeException(String message) {
    super(message);
}
class Father {
  int age;
  public Father(int age) throws WrongAgeException {
    if (age < 0) {
       throw new WrongAgeException("Father's age cannot be negative.");
    this.age = age;
class Son extends Father {
  int sonAge;
  public Son(int fatherAge, int sonAge) throws WrongAgeException {
    super(fatherAge);
    if (sonAge >= fatherAge) {
       throw new WrongAgeException("Son's age cannot be greater than or equal to father's age.");
    this.sonAge = sonAge;
public class Main {
```

```
public static void main(String[] args) {
    Scanner sc = new Scanner(System.in);
    try {
       System.out.print("Enter Father's age: ");
       int fatherAge = sc.nextInt();
       System.out.print("Enter Son's age: ");
       int sonAge = sc.nextInt();
       Father father = new Father(fatherAge);
       Son son = new Son(fatherAge, sonAge);
       System.out.println("Father's age: " + father.age);
       System.out.println("Son's age: " + son.sonAge);
     } catch (WrongAgeException e) {
       System.out.println(e.getMessage());
    System.out.print("UTKRISHT UMANG\n1BM23ET056");
    sc.close();
}
```

```
Enter Father's age: 25
Enter Son's age: 50
Son's age cannot be greater than or equal to father's age.
UTKRISHT UMANG
1BM23ET056
```

## Threads

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

## Algorithm:

2.65
doss College Thread extende Thread
& public college thread (this a marriage
Epublic college Thread (String messages
f nent thorse d (1)
t new thread (a)
2 try
(while (true)
E System out println
(message),
(message); Thread sleep antown).
Cortch (Interrupted Exceptione)
System out printly "Thread
Interrupted "+ message).
(Interrupted Exceptione).  { System.out.println("Thread  Interrupted"+ message); }. start();
3). stant ();
3
public class Multithread Exerciple  £ public static void main (String args[])  {new college Thread ("Bms college of Engineering", 10000)
[ sublic static vaid man (string avers [)
2 From College Threat ("Box College of
Goding and a " water
Crymeeny, 1000
new College Thread ("CSE", 2000);
none unige (niveral ist, 2000);
2
9

11	Ontput:
some	Borr college of Engineering
10	CSE 0 0 0
2 Vacan	Crement and
	CE CON PRONUE & DOCE 3D
	CLE
h	16 CELLY SOUTH ON THE MISSON
adna	BMS lollege of Engineering
D	CSE
	CSE CON MARKET MAN
	CSE MAY
	CS Erant Jalental
NI	CSE MAN AND BOOK OF THE PARTY O

```
class MessageThread extends Thread {
  private String message;
  private int interval;
  public MessageThread(String message, int interval) {
    this.message = message;
    this.interval = interval;
  }
  public void run() {
    try {
       while (true) {
         System.out.println(message);
         Thread.sleep(interval);
     } catch (InterruptedException e) {
       System.out.println(e);
  }
public class MultiThreadExample {
  public static void main(String[] args) {
```

```
// Create two threads with different messages and intervals
    MessageThread thread1 = new MessageThread("BMS College of Engineering", 10000); // 10
seconds
    MessageThread thread2 = new MessageThread("CSE", 2000); // 2 seconds

// Start both threads
    thread1.start();
    thread2.start();

// Print the tag
    System.out.print("UTKRISHT UMANG\n1BM23ET056");
}
```

```
UTKRISHT UMANG
1BM23ET056BMS College of Engineering
CSE
CSE
CSE
CSE
CSE
BMS College of Engineering
CSE
CSE
CSE
CSE
CSE
BMS College of Engineering
CSE
CSE
CSE
CSE
CSE
BMS College of Engineering
CSE
CSE
CSE
CSE
CSE
BMS College of Engineering
CSE
CSE
CSE
```

Interfaces

Algorithm:

```
import java util scannou;
interface Polygon {
donble get Penimeter ();
donble get Area ();
 class Aquane implements Polygon (
     private double side;
      Agnare (double side) {
            this side side;
  public double getPerimeter () {
             return 4 * side;
  public double get Area () {
            return side * side;
  class Triangle implements Polygon {
private double side;
      triongle (danble side) {
this side side;
```

```
public danble get Perimeter () {
        return 3 * side;
public double get Area () {
       rotum ( math squt (3/4) + math.
           pow (side, 2);
public day Main 3
    public static void main (string[] args
          Scanney sc= new Scanner
         System out print C'Ever the length
                        Squame");
           S = SC next Dunble ().
        System out print (" Enter the length of
                     side of the triangle!"
           t= sc. nent Denble ();
        Agnane square = new Agnare (s):
        System out println ("Aquare perimeter."
                       + square get Perimeter ();
      System out pointly ("Square Area: "+
                         square getArea ();
     Mriangle tri= new Mriangle (t);
     System out println (" Triangle primeter:"
                           tri-get Perimeter
     System out pointly ("Tringle Area: "+ togethous
      3 compose ();
```

```
Allowbent:

- Genter the length of side of square: 8

Genter the length of side of triangle: 5

Aprome perimeter: 32.0

Agrangle Area: 64.0

Triangle lenimeter: 15.0

Triangle Area: 10.825317.
```

```
import java.util.Scanner;
interface Polygon {
  double getPerimeter();
  double getArea();
class Square implements Polygon {
  private double side;
  Square(double side) {
    this.side = side;
  @Override
  public double getPerimeter() {
    return 4 * side;
  @Override
  public double getArea() {
    return side * side;
class Triangle implements Polygon {
  private double side;
  Triangle(double side) {
    this.side = side;
  }
```

```
@Override
  public double getPerimeter() {
    return 3 * side;
  @Override
  public double getArea() {
    return (Math.sqrt(3) / 4) * Math.pow(side, 2);
  }
public class maininterface {
  public static void main(String[] args) {
     double s, t;
     Scanner sc = new Scanner(System.in);
     System.out.print("Enter the length of side of square: ");
     s = sc.nextDouble();
     System.out.print("Enter the length of side of triangle: ");
     t = sc.nextDouble();
     Square square = new Square(s);
     System.out.println("Square Perimeter: " + square.getPerimeter());
     System.out.println("Square Area: " + square.getArea());
     Triangle tri = new Triangle(t);
     System.out.println("Triangle Perimeter: " + tri.getPerimeter());
     System.out.println("Triangle Area: " + tri.getArea());
     System.out.print("Chethan K S\n1BM23CS074");
     sc.close();
  }
```

Enter the length of side of square: 8
Enter the length of side of triangle: 5
Square Perimeter: 32.0
Square Area: 64.0
Triangle Perimeter: 15.0
Triangle Area: 10.825317547305483
Utkrisht Umang
1BM23ET056

GUI – Java Swing

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 a NumberFormatException. If Num2 were Zero, the program would throw an Arithmetic Exception Display the exception in a message dialog box.

Emport javan sning . *;
import inva ant +:
import java ant grent Action Event:
import java ant. 4; import java ant. event. Action Event; import java ant. event. Action Listeney;
problèc class Division App extends I framel private I tent Beld rum 1 field, rum 2 Aug
private Itent Feld rum I field, rum 2 Aug
THE TOTAL STATE OF THE TOTAL STA
private Jeuten divide Butten;
public Division App () {
set little (" Integer Division App")  set Layout (new frenchyout ());
set Layout (new growlayout ());
set size (300,200);
set Default Close Operation (J. Frame
set Default Close Operation (JFrame: EXIT_ON-CLOSE);

Itabel numblabel = new Itabel ("Num!" numifield = new Heat Field (10); Thabel mm2 label = new Trabel (Num2: 12) mmzAeld = new Itentield (10). Ilabel nesuro Label = new ILabel ("Result resultireld = new Itentield (10); result Field set Editable (false); Kinde Button = new JButton ("Divide") add (mmslabel); gold (num 1 Reld). add (mm2 Lober); rold (num 2 field) pold ( divide Button) add (nesmtlabel); add nesultfield), divide button add Action Listoner (new Action Listenew Of public void action Pouponmed (Action Event e) & try {
int mm1 = Integer parent ()? int num2 - Integen parsedut (mm 2 field get Tent ()) int result = mm1/mm2, nount field set text (String value

cotton (Number format Exception en) Toption Pame show Message Dialon (Division App. this, " Prease enter "Input Error", Japtionforme . ERROR nision App. tins, "Dirisie zeno is not allowed" "Anthometic Gran", Joptism ane Errop MESSAGE); binally In 18M23CSOOJ 11); Rumable ()1 public void run (){ new Division App () set Visible (mue)

Utkrisht	Integen Obigion - 17 X
16M23CS001	Jutegen Division - 1 x Num 1: [6
	Num2: 3 Divide
	Resint: [2]

```
import javax.swing.*;
import java.awt.*;
import java.awt.event.ActionEvent;
import java.awt.event.ActionListener;
public class DivisionApp extends JFrame {
  private JTextField num1Field, num2Field, resultField;
  private JButton divideButton;
  public DivisionApp() {
    setTitle("Integer Division App");
    setLayout(new FlowLayout());
    setSize(300, 200);
    setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
    JLabel num1Label = new JLabel("Num1:");
    num1Field = new JTextField(10);
    JLabel num2Label = new JLabel("Num2:");
    num2Field = new JTextField(10);
    JLabel resultLabel = new JLabel("Result:");
    resultField = new JTextField(10);
    resultField.setEditable(false);
    divideButton = new JButton("Divide");
    add(num1Label);
```

```
add(num1Field);
    add(num2Label);
    add(num2Field);
    add(divideButton);
    add(resultLabel);
    add(resultField);
    divideButton.addActionListener(new ActionListener() {
       @Override
      public void actionPerformed(ActionEvent e) {
           int num1 = Integer.parseInt(num1Field.getText());
           int num2 = Integer.parseInt(num2Field.getText());
           int result = num1 / num2;
           resultField.setText(String.valueOf(result));
         } catch (NumberFormatException ex) {
           JOptionPane.showMessageDialog(DivisionApp.this, "Please enter valid integers.",
"Input Error", JOptionPane.ERROR_MESSAGE);
         } catch (ArithmeticException ex) {
           JOptionPane.showMessageDialog(DivisionApp.this, "Division by zero is not allowed.",
"Arithmetic Error", JOptionPane.ERROR_MESSAGE);
         } finally {
           System.out.println("Utkrisht Umang\n1BM23ET056");
    });
  public static void main(String[] args) {
    SwingUtilities.invokeLater(new Runnable() {
       @Override
      public void run() {
         new DivisionApp().setVisible(true);
    });
  }
```

