VISVESVARAYA TECHNOLOGICAL UNIVERSITY

"JnanaSangama", Belgaum -590014, Karnataka.



LAB REPORT on

Object Oriented Java Programming

(23CS3PCOOJ)

Submitted by

Gayathri S (24BECE417)

in partial fulfillment for the award of the degree of BACHELOR OF ENGINEERING
in
COMPUTER SCIENCE AND ENGINEERING



B.M.S. COLLEGE OF ENGINEERING
(Autonomous Institution under VTU)
BENGALURU-560019

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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 Gayathri S (24BECS417), 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 during the year 2022. The Lab report has been approved as it satisfies the academic requirements in respect of a Database Management Systems (23CS3PCDBM) work prescribed for the said degree.

Lab faculty Swathi Sridharan Assistant Professor Department of CSE, BMSCE Dr. Joythi S Nayak Professor & HOD Department of CSE, BMSCE

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Github Link:

[&]quot;https://github.com/GayathriS-CSE/OOJ"

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

```
import java.util.Scanner;
import java.lang.Math;
public class QuadraticEquationSolver {
  public static void main(String[] args) {
     Scanner scanner = new Scanner(System.in);
     System.out.println("Enter coefficient A:");
     double a = scanner.nextDouble();
     System.out.println("Enter coefficient B:");
     double b = scanner.nextDouble();
     System.out.println("Enter coefficient C:");
     double c = scanner.nextDouble();
     double discriminant = b * b - 4 * a * c;
     if (discriminant >= 0) {
        double root1 = (-b + Math.sqrt(discriminant)) / (2 * a);
        double root2 = (-b - Math.sqrt(discriminant)) / (2 * a);
        if (discriminant == 0) {
          System.out.println("One real solution: " + root1);
       } else {
          System.out.println("Real solutions:");
          System.out.println("Root 1: " + root1);
          System.out.println("Root 2: " + root2);
     } else {
        System.out.println("No real solutions.");
     scanner.close();
  }
}
```

OUTPUT:

Clear

Enter coefficient A:
2
Enter coefficient B:
14
Enter coefficient C:
5
Real solutions:

Root 1: -0.37750100080080085 Root 2: -6.622498999199199 Name:Gayathri S

Name:Gayathri S USN:24BECS417

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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.

```
import java.util.Scanner;
public class Student {
  String usn, name;
  int[] credits, marks;
  public Student(int numSubjects) {
     credits = new int[numSubjects];
     marks = new int[numSubjects];
  public void acceptDetails(Scanner scanner) {
     System.out.print("Enter USN: ");
     usn = scanner.next();
     System.out.print("Enter Name: ");
     name = scanner.next();
    for (int i = 0; i < credits.length; <math>i++) {
       System.out.print("Enter credits for subject " + (i + 1) + ": ");
       credits[i] = scanner.nextInt();
       System.out.print("Enter marks for subject " + (i + 1) + ": ");
       marks[i] = scanner.nextInt();
    }
  }
  public void displayDetails() {
     System.out.println("USN: " + usn);
     System.out.println("Name: " + name);
    for (int i = 0; i < credits.length; <math>i++) {
       System.out.println("Subject " + (i + 1) + ": Credits = " + credits[i] + ", Marks = " +
marks[i]);
  }
  public double calculateSGPA() {
     double totalCredits = 0, totalGradePoints = 0;
    for (int i = 0; i < credits.length; <math>i++) {
       double gradePoint = marks[i] / 10;
       totalCredits += credits[i];
       totalGradePoints += gradePoint * credits[i];
```

```
}
    return totalGradePoints / totalCredits;
  }
  public static void main(String[] args) {
    Scanner scanner = new Scanner(System.in);
    System.out.print("Enter number of subjects: ");
    int numSubjects = scanner.nextInt();
    Student student = new Student(numSubjects);
    student.acceptDetails(scanner);
    student.displayDetails();
    System.out.println("SGPA: " + student.calculateSGPA());
  }
}
OUTPUT:
  Output
                                                                        Clear
Enter number of subjects: 1
Enter USN: 24BECS417
Enter Name: Gayathri
Enter credits for subject 1: 3
Enter marks for subject 1: 20
USN: 24BECS417
Name: Gayathri
Subject 1: Credits = 3, Marks = 20
SGPA: 2.0
Name:Gayathri S
USN: 24BECS417
```

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-	Con' Con 6	Subjet "+ (1+1) # ";");
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	include methode to accept and display details and calculate SUPA of a student.	Systemout pritty ("Usn!" + usn); Systemout pritty ("Usn!" + usn); Systemout, printly ("Nome:" + name);
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		- public double Calculate SGPAGO
	aublic Student (int num Subjects)	public double calculate SGPACO ; S double total credits = 0, total Grade Points ::
40	& cudits = new int [num Subjects];	(30) idis mun) la con e diana
	marks = new int (num Subjects);	jol Cid izo: il credite la 11:
	yorking iso is and surper it	double aladopaint
30	Marche Madres + Markers - Markers 1	Jol Cint i 20; i 2 credits length; ;++) { double gladePoint = marksci7/10;
	public Void alcept Details (Sconner S)	19 Jan 19 19 19 19 19 19 19 19 19 19 19 19 19
	& System. out. printly ("Enter USN; ");	sotallied to to credity (1):
13	usn=S.next();	10 talquadePoiAs + 2010 ale Point + 1. 124 01
2/3	a do a la collectutate de anom	totalludits += craits cit; totalludits += qualle Point + Credits (17)
	System out printlu(" Enter Name: ");	Rehun total GradePoints/total Credits;
12	name=S.next();	by total Credits;
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	bellint i 201 i Laredits length 1 i+12	tot fint 100 1 tox 1. The
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	Subjet "+ (i+1)+":");	all all con I a find the
	audits (i) = S. next Int();	Self-in ison is and is longth is the self in the self

Scanner S= new Scanner (Steing () augs)

Scanner S= new Scanner (System.in);

System.out. printly ("Enter number of
Subjects; ");

int numbubjects = s. next Int();

Student st = new Student (nem Subjects);

Student st occept Defails (8);

St. displayDefails (1);

System.out. printly (" SGPA:" +

St. Calculate SGPA ());

4.

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.

```
import java.util.Scanner;
class Book {
  private String name;
  private String author;
  private double price;
  private int numPages;
  public Book(String name, String author, double price, int numPages) {
    this.name = name;
    this.author = author;
    this.price = price;
    this.numPages = numPages;
  }
  public void setName(String name) {
    this.name = name;
  }
  public void setAuthor(String author) {
    this.author = author;
  }
  public void setPrice(double price) {
    this.price = price;
  }
  public void setNumPages(int numPages) {
    this.numPages = numPages;
  }
  public String getName() {
     return name;
  public String getAuthor() {
     return author;
```

```
}
  public double getPrice() {
     return price;
  }
  public int getNumPages() {
     return numPages;
  }
   @Override
  public String toString() {
     return "Book Details:\n" +
          "Name: " + name + "\n" +
          "Author: " + author + "\n" +
          "Price: " + price + "\n" +
          "Number of Pages: " + numPages + "\n";
  }
}
public class Test {
  public static void main(String[] args) {
     Scanner scanner = new Scanner(System.in);
     System.out.print("Enter the number of books: ");
     int n = scanner.nextInt();
     scanner.nextLine();
     Book[] books = new Book[n];
     for (int i = 0; i < n; i++) {
        System.out.println("\nEnter details for book " + (i + 1) + ":");
        System.out.print("Enter name: ");
        String name = scanner.nextLine();
        System.out.print("Enter author: ");
        String author = scanner.nextLine();
        System.out.print("Enter price: ");
        double price = scanner.nextDouble();
        System.out.print("Enter number of pages: ");
        int numPages = scanner.nextInt();
       scanner.nextLine();
       books[i] = new Book(name, author, price, numPages);
     }
```

```
System.out.println("\nBook Details:");
for (Book book : books) {
    System.out.println(book);
    }
}
OUTPUT:
Output
Enter the number of books: 1
```

Enter details for book 1: Enter name: Java Enter author: Joe Enter price: 456

Enter number of pages: 450

Book Details: Book Details: Name: Java Author: Joe Price: 456.0

Number of Pages: 450

Name:Gayathri USN:24BECS417

Lab praglam-3. 15.10. heate a class Book which Contains force membus? name, aution, price, pumpages. Include a constructor to set the values for the members. Include methods to set and get the detaile of the objects. Include a to String () method that could display the samplede detalls of the book. Re-lelp a joila program to weaten book objects impor java util. Scanner; public dass Book plivate String name, private String author; private double price; private int rumpages; Book (String name, String author, double peice, int numpages) this name = name; this author; author; this. plice = peice; this, rum-pages=num-pages;

Mgetter and setter methods. public String get Name() leturn name; public wid set Namel String name this name name; public String getAuthol() leture author; 4 public void setAuthor (String aut this author = author; public double get Price () setulu price; 3 public void of Price (double price flus, price = price; 4 public Ent get NumPages () letur num-pages; 4 public void statumPages Cint numpa this num pages = num-pages; } 11 to String method. Eleturn l'alame: thamet, Authorauthort, Price: "tprice t, Name pages: "thum-pages);

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	Book[] books = new Book[n];	
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,	System out, plintly (total the details	Output Matron de mario
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100		the proposition to

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.

```
import java.lang.Math;
abstract class Shape
{
    protected int val1;
    protected int val2;
    Shape(int val1,int val2)
```

```
{
    this.val1=val1;
    this.val2=val2;
  abstract void printArea();
class Rectangle extends Shape
  int area;
  Rectangle(int val1,int val2)
     super(val1,val2);
  void printArea()
     area=val1*val2;
     System.out.println("Area of the rectangle:"+area);
  }
class Triangle extends Shape
  double area;
  Triangle(int val1,int val2)
     super(val1,val2);
  void printArea()
    area=0.5*val1*val2;
     System.out.println("Area of the Triangle:"+area);
  }
}
class Circle extends Shape
  double area;
  Circle(int val1,int val2)
     super(val1,0);
  void printArea()
    area=Math.PI*val1*val1;
     System.out.println("Area of the circle:"+area);
  }
}
public class Test
  public static void main(String args[])
```

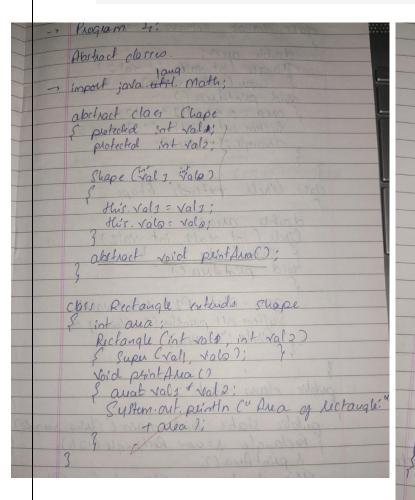
```
Rectangle r=new Rectangle(12,6);
     r.printArea();
     Triangle t=new Triangle(34,6);
    t.printArea();
     Circle c=new Circle(67,0);
     c.printArea();
  }
}
```

OUTPUT:

Output

Area of the rectangle:72 Area of the Triangle: 102.0

Area of the circle: 14102.60942196458



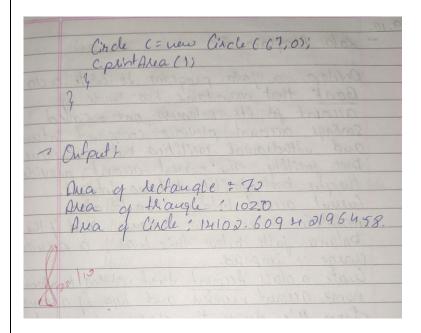
Class Thiangle extends Shape double aua; Thiangle (int rate, but ral 2) Super Cralg Vals); 4 5 aua 2 0.5 * val 2 + val 2; System out printlu (" Area of a Thiangle ;" + areap; class Circle extends Bhape double area; ciscle Ciscle Cist Valz, int Valz? } Super (val 1, 01; 4 Void plint Area () aua = Math, PI + vall * vall) System-out printly (" Alea of a lircle; "faug); public class Test public static soid main (Stung augoli)

Rectangle 2= new Rectangle (126).

1. print Area ();

(Mangle += new Thiangle (34,6);

I print Area ();



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
- d) Permit withdrawal and update the balance

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

```
class Account {
   public String customerName;
   public String accountNumber;
   protected double balance;

public Account(String customerName, String accountNumber) {
    this.customerName = customerName;
    this.accountNumber = accountNumber;
    this.balance = 0.0;
}
```

```
public void deposit(double amount) {
    balance += amount;
     System.out.println("Deposited amount: " + amount);
  public void displayBalance() {
     System.out.println("Balance amount: " + balance);
  public void withdraw(double amount) {
    if (amount <= balance) {
       balance -= amount;
       System.out.println("Withdraw amount: " + amount);
       System.out.println("Insufficient balance for withdrawal!");
  }
  protected double getBalance() {
    return balance;
}
class SavAcct extends Account {
  private double interestRate;
  public SavAcct(String customerName, String accountNumber, double interestRate) {
    super(customerName, accountNumber);
    this.interestRate = interestRate;
  }
  public void computeAndDepositInterest() {
    double currentBalance = getBalance();
    double interest = currentBalance * interestRate / 100;
    deposit(interest);
     System.out.println("Interest deposited: " + interest);
  }
  public String toString()
  { return "Customer Name: "+customerName+"\nAccount Number: "+accountNumber; }
}
class CurAcct extends Account {
  private double minimumBalance:
  private double serviceCharge;
  public CurAcct(String customerName, String accountNumber, double minimumBalance,
double serviceCharge) {
    super(customerName, accountNumber);
    this.minimumBalance = minimumBalance;
    this.serviceCharge = serviceCharge;
  }
  public void withdraw(double amount) {
    if (getBalance() - amount < minimumBalance) {</pre>
```

```
System.out.println("Service charge imposed: " + serviceCharge);
       deposit(-serviceCharge);
       System.out.println("Insufficient balance.");
    } else {
       super.withdraw(amount);
  public String toString()
  { return "Customer Name: "+customerName+"\nAccount Number: "+accountNumber; }
public class Bank {
  public static void main(String[] args) {
     SavAcct savingsAccount = new SavAcct("Alice", "S12345", 5.0);
     System.out.println("Customer details:\n"+savingsAccount.toString());
     System.out.println("\nTransaction details:");
     savingsAccount.deposit(1000);
     savingsAccount.computeAndDepositInterest();
     savingsAccount.displayBalance();
     savingsAccount.withdraw(500);
     savingsAccount.displayBalance();
     System.out.println();
     CurAcct currentAccount = new CurAcct("Bob", "C12345", 1000, 50);
     System.out.println("Customer details:\n"+currentAccount.toString());
     System.out.println("\nTransaction details:");
     currentAccount.deposit(2000);
     currentAccount.displayBalance();
     currentAccount.withdraw(1900);
     currentAccount.displayBalance();
     currentAccount.withdraw(200);
     currentAccount.displayBalance();
  }
}
```

OUTPUT:

Output

Customer details:

Customer Name: Alice

Account Number: S12345

Transaction details:

Deposited amount: 1000.0

Deposited amount: 50.0

Interest deposited: 50.0

Balance amount: 1050.0

Withdraw amount: 500.0

Balance amount: 550.0

Customer details:

Customer Name: Bob

Account Number: C12345

Transaction details:

Deposited amount: 2000.0

Balance amount: 2000.0

Service charge imposed: 50.0

Deposited amount: -50.0

Insufficient balance.

Balance amount: 1950.0

Withdraw amount: 200.0

Balance amount: 1750.0

Name:Gayathri S USN: 24BECS417

Schillet enterois Accounts.

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Parblic Sax Act C String customer name
Slesse account no String acc type,
darble sofwest rate? class Accounts pinde public String account no; public String account no; public String account no; public String account no; printete dauble balance; protected. Super Carstoner vans, account no Lis. Intuest rate = 0.05; public Accounts CString austomer none String accountry, String account, doubte balance) public Noid get Balance () this austomer vame : histomer vame; His. account no = account no; & lehun balance; this. all type - all type; public Moi'd compute And Reposit Forkuest () this. balance = 0.0; double current balance = get Babu (C) double Extrest = Current balance + Entrust rate /100; public roid deposit (double amount) balance += amount; deposit (Enterest tole). System out perintly (" Deposited" to mout); Systemat printla C" Intust deposited? interest): public void diplay bolance () System out printlu C' Balance; "+ balone); class autit entagolo Accounts. void withdraw (double amount) f if (amount) amount) private double minimum balone. balance -= amount; pervale double pervictionges System. out. peintlu ("Withdraw amount: "+ amount); E System. out. print n C" Froughicient balana"); & public AclurAct (String customer namer String account no String acc type double minimumbalance, danble public Bank class Bank public static void main (String 1) curas) service charge) SanAct ("Alice " 8223 45"), 450); Juper Caistonner vane, account no His minimumbalance = 1000 Salinga court. Deposit (1000;) Saving account Compute And Reposit Enteresty His. Pervice change = 50; Saving account display balances; Conling account - with draw (500; Sarling account. display Balance (); public withdraw (double amount) of double current Balance = get Balance Disector); S. O. p (7) if Commetbalance - a maint & nin neunitalouni ¿ deposités envice harge); Curfet current ficant - new A-Cur Act Co Jou S. O. P (" Sentice Charge!" + Sentice clauge) (4769"); S. o. pl" Insufficient balance"); Curent Auout: deposit (2000) Cours Account, display Balance (); else Current withdraw (1900) 2 Saper withdraw Comment)? Curait Account . Display Balance (); Current Account, with draw (200); Current Account odisplay Balance (); private double get Balance (1 S estam palance; ?

Customer- de fails: Output: Customer Name! John Account number: CH769 Customer defails: Customer Name: Alice Transaction details: Account Mumker: 510345 Reposited amount: 2000, s Bolance amount : 2000.0 Transaction details: Surlice charge imposed: 50.0. Reposited amount: 10000.0 Deposited amount: -50.0 Insufficient balance. Deposited amount: 50.0 Balance amount: 1950.0 Interest deposited: 50.0 withdraw amount: 200.0 Balance amount : 1050.0 Balance amount: 1750.0 Withdraw amount: 500.0 Balance amount: 550.0

Lab program-6

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.

```
CODE:
```

```
package CIE;

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

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

public class Internals {
    public int[] internalMarks = new int[5];

public Internals(int[] marks) {
        if (marks.length == 5) {
```

```
System.arraycopy(marks, 0, internalMarks, 0, 5);
     } else {
       throw new IllegalArgumentException("Exactly 5 marks are required for internal
marks.");
     }
  }
}
// Package SEE: Contains External class
package SEE;
import CIE.Student;
public class External extends Student {
  public int[] externalMarks = new int[5];
  public External(String usn, String name, int sem, int[] marks) {
     super(usn, name, sem);
     if (marks.length == 5) {
       System.arraycopy(marks, 0, externalMarks, 0, 5);
     } else {
       throw new IllegalArgumentException("Exactly 5 marks are required for SEE marks.");
  }
}
// Main Program: Computes final marks
import CIE.*;
import SEE.*;
import java.util.Scanner;
public class FinalMarks {
  public static void main(String[] args) {
     Scanner scanner = new Scanner(System.in);
     System.out.print("Enter the number of students: ");
     int n = scanner.nextInt();
     scanner.nextLine();
     External[] students = new External[n];
     for (int i = 0; i < n; i++) {
       System.out.println("\nEnter details for student " + (i + 1) + ":");
       System.out.print("Enter USN: ");
       String usn = scanner.nextLine();
       System.out.print("Enter Name: ");
```

```
System.out.print("Enter Semester: ");
        int sem = scanner.nextInt();
        System.out.println("Enter Internal Marks (5 courses):");
        int[] internalMarks = new int[5];
       for (int j = 0; j < 5; j++) {
          internalMarks[j] = scanner.nextInt();
       }
        System.out.println("Enter SEE Marks (5 courses):");
        int[] externalMarks = new int[5];
       for (int j = 0; j < 5; j++) {
          externalMarks[j] = scanner.nextInt();
        scanner.nextLine();
        Internals internals = new Internals(internalMarks);
        students[i] = new External(usn, name, sem, externalMarks);
        System.out.println("\nCalculating final marks for student...");
     }
     System.out.println("\nFinal Marks for all students:");
     for (External student : students) {
        System.out.println("\nUSN: " + student.usn);
        System.out.println("Name: " + student.name);
        System.out.println("Semester: " + student.sem);
        System.out.println("Final Marks:");
       for (int j = 0; j < 5; j++) {
          int finalMark = (student.externalMarks[j] / 2) + student.internalMarks[j];
          System.out.println("Course " + (j + 1) + ": " + finalMark);
       }
     }
                                        :\Users\admin\Desktop\417>java Main
                                       Enter the number of students: 1
     scanner.close();
                                       Enter USN: 24BECS417
  }
                                       Enter Name: GAYATHRI
                                       Enter Semester: 3
}
                                        nter 5 internal marks:
OUTPUT:
                                       Enter 5 SEE marks:
                                        inal Marks for Student: GAYATHRI (USN: 24BECS417)
                                        Course 1: 68
                                        Course 2: 63
                                        ourse 3: 77
                                        Course 4: 68
                                        Course 5: 78
```

String name = scanner.nextLine();

19/11.	Lab program 6. [Packages].
-1	Shident java
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	Dublic China UCD
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	withdraw amonat: 500.0
	Ralance amount: 550.0
-1	Intunals jala interest umday
ρ	ackage CIE; MAN MANNER TANDER
P	ublic class Intunalss
r	public inter intermalMarks = new inter;
	audic Caturale Citica 176
	public intunals Cint (2 marks 75
	for Cint 150, K5; 1++25
	intunal Mailes [i] = Mailes ei];
	1) DOCK DOMAND : - SO O
2	Salational balance
- 5	Rolans and mark : 1950.0
/	Le l'alle angent l'avent
> Ex	ternal into
	leural java.
P	acleage SEE; import CIE. Student; blic class External;
Pu	one class Entirels
William Co.	

public inters seemales - www inter;

public Extural string usn, string verne; int

Sern, inter malled?

Supul usn, name, sem;

for list ize; iss; it+d;

permaits cit = marks cit;

import sale tit! Scenner;

abbic class main?

public static void main (string argues)?

Scanner S = new Scenner (Rytemis):

S. o. p. ("Enter the no of strends")

int n= S: next (nt;

for list ize; isn; i+t)?

S. o. p. ("Enter usn;");

or int perm = p.next (");

int perm = p.next (");

int perm = p.next (");

s. o. p. ("Enter alless - Cnew Inters);

s. o. p. ("Enter s' interval marks:");

for C'nt; =0; j65; jtt) f

intural Marks G; J = S. nent(s; 2,

S. nent fine (s);

S. o. p ("Enter & SEE marks");

Jot Cint; =0; j65; jtt) f

See Marks Gj = S. nent 2nt(s; 2,

S. next line(s);

Internals != new Enternals Cintural marks 7;

Enternals != new Enternals Cusn, nam; Sem,

See Marks Gj = S. nent 2nt(s);

Enternals != new Enternals Cusn, nam; Sem,

See ("In final marks por Stemars 3;

Internals != new Enternals Cusn, nam; Sem,

See ("In final marks por Stemars 3;

Internals != new Enternals Cusn, nam; Sem,

See ("In final marks por Stemars 3;

Internals != new Enternals Cusn, nam; Sem,

See ("In final marks por Stemars 3;

Internals != new Enternals Cusn, nam; Sem,

See ("In final marks por Stemars 3;

Internals != new Enternals Cusn, nam; Sem,

See ("In final marks por Stemars 3;

See ("Course" + (j+1) + "!" + final marks);

See ("Course" + (j+1) + "!" + final marks);

See (s);

See (s);

Enter the no. of shider: 2.

Enter usp: Dubecs 417.

Enter nam: Gayathir:

Enter s internal marks:

10

9

8

10

10

Enter 5 SEE marks.

10

9

9

Course 1: 9 10

Course 3; w

Course 4; 9

Course 4; 9

Course 5; to.

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 Wrong Age() when the input age<0. In Son class, implement a constructor that cases both father and son's age and throws an exception if son's age is >= father's age.

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

```
}
    if (sonAge >= fatherAge) {
      throw new InvalidAgeDifference();
    this.sonAge = sonAge;
  }
}
public class Main {
  public static void main(String[] args) {
    Scanner scanner = new Scanner(System.in);
    try {
       System.out.print("Enter Father's age: ");
       int fatherAge = scanner.nextInt();
       System.out.print("Enter Son's age: ");
       int sonAge = scanner.nextInt();
       Son son = new Son(fatherAge, sonAge);
       System.out.println("Father's age: " + son.age);
       System.out.println("Son's age: " + son.sonAge);
    } catch (WrongAge | InvalidAgeDifference e) {
       System.out.println("Exception caught: " + e.getMessage());
    } finally {
       scanner.close();
    }
  }
}
OUTPUT:
   Output
Enter Father's age: 34
Enter Son's age: 12
Father's age: 34
Son's age: 12
Name:Gayathri S
USN: 24BECS417
```

class father { int age; -> Lab-program: 7. Wife a program that demonstrates public Tather (int aage) throws Wrong Age ():
if Cage (0) {
throw new Wrong Age (); hadling of enceptions in solventance two.

Luale a base class called "Father" and

devided class called "Soo" which

extends the base class. In Tather class

somplement a constructed which takes the this age = age; age and throws the exception Whang Ager) when the soput age to To son class, Implement a constructor that uses both class Son entends father { int sonlige juthe and son's age throws an enception if son's ange 32 juther's age. public Son Cint fallundge int Sondge)
throws Wrong Age Envalid Age Difference
if (son Age < 0) 's
throw new Wrong Age (); -> import jara. util. Scanner; dass Whoney Age entends Enception S public Wrong Age () 5 Super (" Age (an not be negative"); if (son Age > = feether Age) {
 throw we meaded Age Difference is His confige = Sonfige; Class Invalid Age D'Heunce entends Exeptions
public Invalid Age D'Heunce () Super of equal to Tather's agen; public class Exeption Handling { public static void main (Steing argser)

Sconner Scanner = new Sconner Systeming Entu Father's age: 34. try (
System. out plint ("Forter Father's age:");
int juther Age = scanner. next Int (); Jatheis age: 34. Son's age: 13 Enter Father's age: 12 System out print "Enter Son's age:"); Sont sun Age = scanner. next Int (); Enter Son's age: 45. Exception cought: Son's age con't be greater than of equal to father's age Son Son = new Son (father Age, Sontge); -> Enter father's age: 30 System. at print In C" Tather's age: "+Son. son's age: -5 Enter Exception caught: Age con't be negative. System out printin (" Son's age: "+son 2 SonAger, Catch (Wrong Age Intalid Age O'fleunce) {
System out println ("Enception Caught" + e. get Message (); finally { Scannel. close(2)

25

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.

```
class DisplayBMS implements Runnable {
   @Override
  public void run() {
     try {
       while (!Thread.currentThread().isInterrupted()) {
          System.out.println("BMS College of Engineering");
          Thread.sleep(10000);
       }
     } catch (InterruptedException e) {
       System.out.println("BMS Thread Interrupted");
  }
}
class DisplayCSE implements Runnable {
   @Override
  public void run() {
     try {
       while (!Thread.currentThread().isInterrupted()) {
          System.out.println("CSE");
          Thread.sleep(2000);
     } catch (InterruptedException e) {
       System.out.println("CSE Thread Interrupted");
  }
}
public class CollegeThreads {
  public static void main(String[] args) {
     Thread thread1 = new Thread(new DisplayBMS());
     Thread thread2 = new Thread(new DisplayCSE());
     thread1.start();
     thread2.start();
     try {
```

```
Thread.sleep(20000);

thread1.interrupt();

thread2.interrupt();

thread2.join();
} catch (InterruptedException e) {
    System.out.println("Main Thread Interrupted");
}

System.out.println("Both the threads have stopped")
}
```

OUTPUT:

```
Output
BMS College of Engineering
CSE
CSE
CSE
CSE
CSE
BMS College of Engineering
CSE
CSE
CSE
CSE
CSE
BMS Thread Interrupted
CSE Thread Interrupted
Both the threads have stopped
Name:Gayathru S
USN: 24BECE417
```

Write a program which crates hoo tenado once tenad displaying "BMS College of Engineering" once every ten secondo and another displaying "CSF" Once along two seconds. class Displayers implements Runnable ? private volatile boolean shop Reguested = Talse: public void inoc? { try { while Etrue 15 System out println ("BMS College of Engineering "); Theyeard. Sleep (10000); 4 catch (Intersuped Exception e) { System. out. perotla ("BMS Thread got infullipted "); public Nord Shop Theread () { Stop Requested = thue;

class Display(SE implements Runnable {
 peivate volable boolean StopRequested=Talor; public xoid hun () { try { while (ture) { System out peintln (" (SE"); Thread Deep (2000); (atch (Interrupted Exception e) & System out perintly ("CSE Thread got interrupted"); public void stop Thuad() { ShopRequested = frue; public class (ollege Thread () } puldic static toid main (String augs) {
Thuad It = new Thread (new DisplayBine()) Thread to : new Thread (new Diplay (SE()); fictarte); ta. start(); Thread. Deep (20000); 3 catch (Interrupted Exception e) } S. o.p (" Main threeal got interrupted)