## VISVESVARAYA TECHNOLOGICAL UNIVERSITY

"JnanaSangama", Belgaum -590014, Karnataka.



## LAB REPORT on

# Object Oriented Java Programming (23CS3PCOOJ)

Submitted by

StudentName (1BM23CS063)

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 **Bhavya Goyal (1BM23CS063)**, who is bonafide student of **B.M.S. College of Engineering.** It is in partial fulfillment for the award of **Bachelor of Engineering in Computer Science and Engineering** of the Visvesvaraya Technological University, Belgaum. The Lab report has been approved as it satisfies the academic requirements in respect of an Object Oriented Java Programming (23CS3PCOOJ) work prescribed for the said degree.

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

## Index

Sl. No.	Date	Experiment Title	Page No.
1	1/10/2024	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	
2	8/10/2024	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.	
3	15/10/2024	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.	
4	22/10/2024	Create an abstract class animal with method eat and sleep and create three subclass lion, bear, tiger which extends animal class and implement eat and sleep method based on behaviour.	
5	22/10/2024	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.	
6	29/10/2024	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.	
7	12/11/2024	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.	
8	19/11/2024	We have created an interface named Polygon. It includes a default method getPerimeter() and an abstract method getArea().  We can calculate the perimeter of all polygons in the same manner so we implemented the body of getPerimeter() in Polygon.  Now, all polygons that implement Polygon can use getPerimeter() to calculate perimeter.  However, the rule for calculating the area is different for different polygons.  Hence, getArea() is included without implementation.  Any class that implements Polygon must provide an implementation ofgetArea()	

9	26/11/2024	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=father's age.	
10	3/12/2024	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.	

Github Link:

https://github.com/1bm23cs063/Java-Lab-Program.git

Program 1
Implement Quadratic Equation

Algorithm:

```
mout point ("Enter coeff a, bo
             -b+ maths soft discrimin
```

```
Code:
import java.util.Scanner;

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

        System.out.print("Enter coefficient a: ");
        double a = sc.nextDouble();

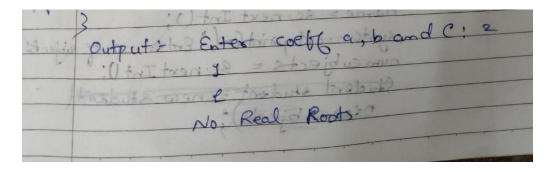
        System.out.print("Enter coefficient b: ");
```

```
double b = sc.nextDouble();

System.out.print("Enter coefficient c: ");
double c = sc.nextDouble();

double 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);
    System.out.println("Roots are: " + root1 + " and " + root2);
} else if (discriminant == 0) {
    double root = -b / (2 * a);
    System.out.println("Root is: " + root);
} else {
    System.out.println("No real roots.");
}
sc.close();
}
Output:
```



#### Program 2 SGPA of student

Algorithm:

```
Q Create a class Book which centains four
    members name, author, price, humpage
    Include a constructor to set the value
    for the members. Include methods
    to set and get the cletails of the
    objects. Include a to string () method
    that could display the complete detail of the book. Develop a Java
   Program to create in book objects.
  import - javantil sc;
  class Book ten to
  String name;
   String author;
      double price;
  int NumPages;
      public Book Stoing name, Stoing author
       & double price, int NumPages) &
       this name;
         this name;
         This name = name;
         this author = author;
         this paice = paice;
         this. Num Pages = Num Pages;
    public string set Name ( string name) of
       this name = name;
   public stoing get Name () 2
       return name;
```

```
for (int i = 0; i < num subject; in) &

System out point ln ("Enter coolds

Stuckent coeslits [i] = so next Int();

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System out point ln ("Coeslit is")

I student coeslit (i)) } &

I student coeslit (i) } &
```

### Code:

```
import java.util.Scanner;
public class Student {
  String usn;
  String name;
  int[] credits;
  int[] marks;
  int numSubjects;
  public Student(int numSubjects) {
    this.numSubjects = numSubjects;
    credits = new int[numSubjects];
    marks = new int[numSubjects];
  public void acceptDetails() {
     Scanner sc = new Scanner(System.in);
    System.out.print("Enter your USN: ");
     usn = sc.nextLine();
    System.out.print("Enter your Name: ");
    name = sc.nextLine();
```

```
System.out.println("Enter details for " + numSubjects + " subjects:");
  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();
}
public void displayDetails() {
  System.out.println("\nStudent Details:");
  System.out.println("USN: " + usn);
  System.out.println("Name: " + name);
  System.out.println("Subjects Details:");
  for (int i = 0; i < numSubjects; i++) {
     System.out.println("Subject " + (i + 1) + ": Credits = " + credits[i] + ", Marks = " + marks[i]);
}
public double calculateSGPA() {
  int totalCredits = 0;
  int totalPoints = 0;
  for (int i = 0; i < numSubjects; i++) {
     int gradePoint = getGradePoint(marks[i]);
     totalCredits += credits[i];
     totalPoints += gradePoint * credits[i];
  return (double) totalPoints / totalCredits;
}
private int getGradePoint(int marks) {
  if (\text{marks} >= 90) return 10;
  else if (marks \geq 80) return 9;
  else if (marks \geq 70) return 8;
  else if (marks \geq 60) return 7;
  else if (marks \geq 50) return 6;
  else if (marks \geq 40) return 5;
  else return 0; // Fail grade
public static void main(String[] args) {
  Scanner sc = new Scanner(System.in);
  System.out.print("Enter the number of subjects: ");
```

```
int numSubjects = sc.nextInt();
Student student = new Student(numSubjects);
student.acceptDetails();
student.displayDetails();
double sgpa = student.calculateSGPA();
System.out.printf("SGPA: %.2f\n", sgpa);
}
Output:
```

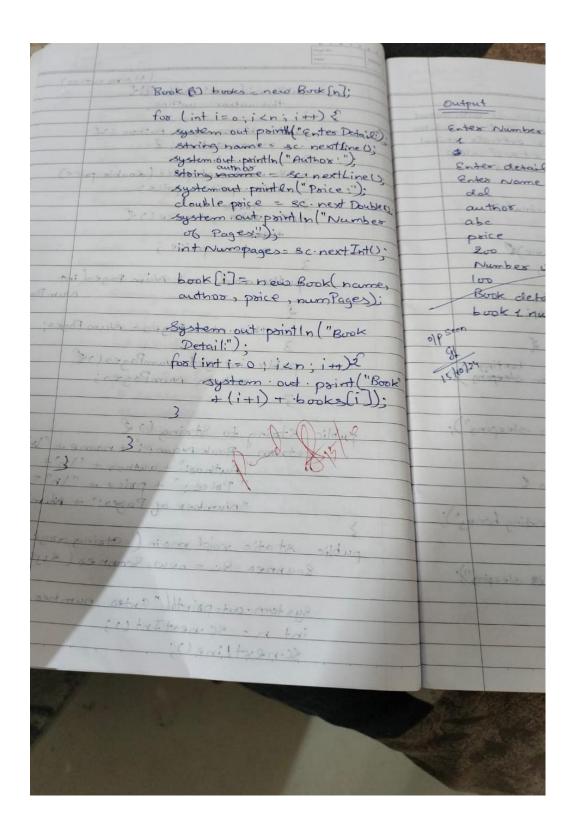
Program 3 Book Information

Algorithm:

2/04/2024 Develop a Java program to create a clay student with members um, name, an array credits and an array marks. Include methods to accept and display details and a method to calculate SGPA of a student pub Class Student public class student & impost java. util \*; claire student of Stoing usn; String name; int () credit; int() num subjects; Void Acceptate Void Accept Betails & student (int num Subjects) 2 credits = new Int (new subjects) mark = new Int [ new subject) public static void main ( stoing [] args) Scanner SC = new scanner ( system in) system out pointly (" enter your usn) enter your name system out pointly er (" Enter no of subject" Sc. next Int U; student = new student

public void set Author ( et sing autros) this author = author; public stoing get Author Of setuan author; & public void set price (double price) this price = poice; 3 double get price () & return price; public roid set Num Pages (int Num Pages) It this Num Pages - Num Pages; public int get NumPages () & return NumPages; public stoing to Stoing () & return " Book Name!" + name + "h"+

"Author:" + author + "h"+ "Price: " + price + " \h"+ "Number of Pages:" + NumPagest; public static roid main ( string args[])2 Scanner Sc = new Scanner ( System in) system. out. pointh "Enter number us books" int n = Sc. next Int (); scnextline();



Code: 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 String getName() {
  return name;
public void setName(String name) {
  this.name = name;
public String getAuthor() {
  return author;
}
public void setAuthor(String author) {
  this.author = author;
public double getPrice() {
  return price;
public void setPrice(double price) {
  this.price = price;
public int getNumPages() {
  return numPages;
public void setNumPages(int numPages) {
  this.numPages = numPages;
}
public String toString() {
  return "Book Name: " + name + "\n" +
       "Author: " + author + "\setminusn" +
```

```
"Price: " + price + "\n" +
         "Number of Pages: " + numPages + "\n";
  }
public class BookMain {
  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();
     Book[] books = new Book[n];
     for (int i = 0; i < n; i++) {
       System.out.println("Enter details for Book " + (i + 1) + ":");
       System.out.print("Enter Name: ");
       String name = sc.nextLine();
       System.out.print("Enter Author: ");
       String author = sc.nextLine();
       System.out.print("Enter Price: ");
       double price = sc.nextDouble();
       System.out.print("Enter Number of Pages: ");
       int numPages = sc.nextInt();
       sc.nextLine(); // Consume the newline character
       books[i] = new Book(name, author, price, numPages);
     System.out.println("\nBook Details:");
     for (int i = 0; i < n; i++) {
       System.out.println("Book" + (i + 1) + ":\n" + books[i]);
  }
```

Output:

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	Output
Laur	Entex Number of Books
	Enter details
	Enter Name
	abc abc
	Price 200 Commenter Denish
	Number of pages
	Book details
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Program 4 Abstract Class Animal

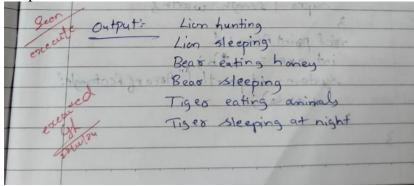
Algorithm:

import java util \*; conte abstract class animal & stoing name; Animal (string name) this-name = name; abstract voice eat; abstract roid sleep; Class lion extends Animals of void eat ();5 system out pointln ("Lion steeping") void sleep(); & system out pointln (" Lion sleeping"); class bear extends Animals & void eat (); 9 system out pointln ("bead eating honey" roid sleep U; & system. out. pointln ("Bear is sleeping") class tiges extendes Animals & system out pintly " Tiges eating . animals"); void sleeps; & system out point In ("Tiger sleeping at night"); public class main ? public static voice main ( stoins ( 2009) 5 animal lion: new lion (); animal bear = new bearli; animal tiger = new ligerly; lion eat (); lion- sleep(): bear eat (1) bear sleep() tigeor eat () tiges sleep()

```
Code: import java.util.*;
abstract class Animal {
  String name;
  Animal(String name) {
     this.name = name;
  abstract void eat();
  abstract void sleep();
class Lion extends Animal {
  Lion(String name) {
     super(name);
  void eat() {
    System.out.println(name + " is eating meat.");
  void sleep() {
    System.out.println(name + " is sleeping.");
}
class Bear extends Animal {
  Bear(String name) {
     super(name);
  void eat() {
     System.out.println(name + " is eating honey.");
  void sleep() {
    System.out.println(name + " is sleeping.");
  }
class Tiger extends Animal {
  Tiger(String name) {
     super(name);
  }
```

```
void eat() {
     System.out.println(name + " is eating other animals.");
  void sleep() {
    System.out.println(name + " is sleeping at night.");
  }
}
public class Main {
  public static void main(String[] args) {
     Animal lion = new Lion("Lion");
     Animal bear = new Bear("Bear");
     Animal tiger = new Tiger("Tiger");
    lion.eat();
    lion.sleep();
     bear.eat();
    bear.sleep();
     tiger.eat();
    tiger.sleep();
  }
}
```

Output:



Program 5: Abstract Class Shape Algorithm:

import java util *;
abstract class & Shape &
inta; cotas min
int b; capable and
shape (inta, intb) &
this a = q;
this b=objects
3
& abstract roid point Area();
1 10000 4000
Class Rectargle extends grans
Rectange (int length, int width) {
super (length, wialth);
3 (2019) wolden)
voir land A is as
177 9889 = 9 x );
system out pointln ("Area of Rectangle." + area);
+ as la);
3

class Toxionale extends shape of Toxionale (int base, int height) & B super (base, height); void point Asea () & double area = 0.5 \* of b.
system out pointln " Asea of Toiangle:" tasea); class Circle extends shape { Circle (int radius) & super (radius, 0); 3 roicl pointAvealle & double area = math. PI +a+a; system out pointln ("Area of Circle"+ area); public class main & public static void main ( stoing () angole Scanner SC = new Sc (systemin); system out point ("Enter length of rectangle: "); int & ectangle length = sc-nextIntly System out point ("Enter barey int to image height = ac next Into shape to langle = new To langle (triangle Boxe , retainingle Height system out point l'Enter sol saclius: "); int @ circle Radius = Qc. next Into Shape circle = new Circle ( circle Radius): occtungle point Aseals to langle point Aveal; ciscle point Area(); sciclose();

```
Code:
import java.util.*;
abstract class Shape {
  int a;
  int b;
  Shape(int a, int b) {
     this.a = a;
     this.b = b;
  }
  abstract void printArea();
class Rectangle extends Shape {
  Rectangle(int length, int width) {
     super(length, width);
  }
  void printArea() {
     int area = a * b;
     System.out.println("Area of Rectangle: " + area);
  }
}
class Triangle extends Shape {
  Triangle(int base, int height) {
     super(base, height);
  }
  void printArea() {
     double area = 0.5 * a * b;
     System.out.println("Area of Triangle: " + area);
  }
}
class Circle extends Shape {
  Circle(int radius) {
     super(radius, 0); // `b` is not used for Circle
  }
  void printArea() {
     double area = Math.PI * a * a;
     System.out.println("Area of Circle: " + area);
}
```

```
public class Main {
  public static void main(String[] args) {
     Scanner sc = new Scanner(System.in);
     System.out.print("Enter length of rectangle: ");
     int rectangleLength = sc.nextInt();
     System.out.print("Enter width of rectangle: ");
     int rectangleWidth = sc.nextInt();
     Shape rectangle = new Rectangle(rectangleLength, rectangleWidth);
     System.out.print("Enter base of triangle: ");
     int triangleBase = sc.nextInt();
     System.out.print("Enter height of triangle: ");
     int triangleHeight = sc.nextInt();
     Shape triangle = new Triangle(triangleBase, triangleHeight);
     System.out.print("Enter radius of circle: ");
     int circleRadius = sc.nextInt();
     Shape circle = new Circle(circleRadius);
     rectangle.printArea();
     triangle.printArea();
     circle.printArea();
     sc.close();
Output:
```

```
enter lengthe of rectangle 20
Enter loidth of rectangle to
Enter base of toigngle to
Enter height of triangle 20
Area of rectangle 200:

Area of toigngle 100:0

Enter radius of circle 5

Area of circle 78.5
```

Program 6 Bank Class Algorithm:

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import Java utll to	7/45
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accho.	
couple balance:	
system out pointful Enter the	
deposit Amount:"):	
(imburnt:);	
Scarrage of	
Scanner &c = new scanner (system in);	
	257
1 amount	39
double amount = scan next Double ;	
3 solomo hor amount,	
Correr amon June	
boolern withdrawel (double amount)	
if (amount > balance) &	201
such al will l'al	000
system out println "Balance is	
In sufficient);	
return false;	
setusn false;	
balance & = amount;	
(3089)	
deturn Toue;	
Durging 3 att 1 atting two material steers	
@ overoide	
a overoide	
public stoing to stoing () &	
· · · · · · · · · · · · · · · · · · ·	
return " this accno is" + accord accno	2+
" the ty	20
Marine 1 120 11 1 1 pp +	
To account is " + type +	

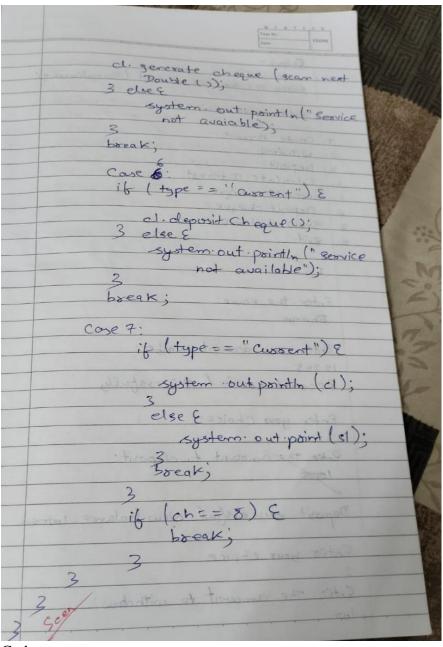
"the balance "is" + balance Account ( stoing name, intaccon) this name = name; this accno = accno; balance - o; class Daving Account extends Account & · double rate = 7; Baving Account (stoing name, int accno) ? super (name, accord); this type = "saving"; void (calc Interest ( int year) E double interest = balancex maths pow (1+ rate/100) year) - balance; system out pointly ("the compound necest is" + interest); balance += interest;

Class cuspent Account extends Account Current Account ( String name, int super (name , accno); this type = " current "&; stoing generate chequel double sctum " cheque generated + acno+
"and name is" + name + " amount is" + amount; 3 void deposit chequely deposit (); system out pointly (" cheque deposit Success Bully"); 13 boolean withdraw (double amount) super with draw (amount) this comount ( 2000) this amount = 100; system out point In (" loo supers deducted as penalty"); return Tous;

3 return false; clse E public class Bank & public static void main (strings) int ch; Scanner Scan - new Scanner (system.in); system out point In ("Enter the boolean etatus; Saving Account 21; Current Account cl; stoing type = scan-next Line while (tout) & system out pointly " Ente any one of the choicely 1. Current Account 2- withdraw 2. deposit
4. Calculate interest
5. Grenerate cheque
6. Deposit cheque

-	
	Page No. 1
	7. 0.
100	7. Show balance ").
	ch = g can next Into;
	switch (ch)
	E Ch (ch)
	Case I:
	if type early 1. ("
	int accord = scan next inely
	si si = new Saving Account
	3 else & (name, accord);
	storing name = scan nextlines;
	int accord = scan:nextLines);
	TO THE U.S.
	CI = new & Current Account's
	(name, accord);
1706	break; 1000
4	
	Case 2: double d = scan.
100	next Double ();
1 1 to	next Double (),
	if (type == "Saving") E
	1 41 1 1 - 21 - 21 1
	status = 81. withdraw
1	(d);
4	3 1 1 1 1 1 1 1
	else if (type == "cuso end")
	about 1 status = cl. withdraw
	Na Home de transport (d);
ing	2
	5

if (status) E system out pointly ("withdrave) successful"); system out point (n ("without unsuccessfull"); break; Case 3: deposit(); Cosey: system. out point in ("Enter year"); "if (type = "saving") St calc Interest ( gran next Int else &. system out pointin ("Not far current account"); break; Case 5: et (type = = "Cussent") system out pointln (" Enter the amount to make cheque")



Code:

```
mport java.util.*;
```

```
public class Main {
  public static void main(String[] args){
    int ch;
    String type;
    Scanner scan = new Scanner(System.in);
    System.out.println("Enter the type of account (Saving/Current):");
    type = scan.nextLine();
    boolean status;
    SavingAccount s1 = new SavingAccount();
    CurrentAccount c1 = new CurrentAccount();
```

```
while (true) {
       System.out.println("Enter your choice: \n 1. Create Account \n 2. Withdraw \n 3. Deposit \n 4.
Calculate Interest \n 5. Generate Cheque \n 6. Deposit Cheque \n 7. Show Balance \n 8. Exit");
       ch = scan.nextInt();
       switch (ch) {
         case 1:
            System.out.println("Enter the name:");
            String name = scan.next();
            System.out.println("Enter the account number:");
            int accno = scan.nextInt();
            if(type.equalsIgnoreCase("saving")){
              s1 = new SavingAccount(name, accno);
            } else {
              c1 = new CurrentAccount(name, accno);
            System.out.println("Account created successfully");
            break;
         case 2:
            System.out.println("Enter the amount to withdraw:");
            double amount = scan.nextDouble();
            if(type.equalsIgnoreCase("saving")) {
              status = s1.withdraw(amount);
            } else {
              status = c1.withdraw(amount);
            System.out.println(status? "Withdraw completed successfully": "Withdraw
unsuccessful");
            break:
         case 3:
            if(type.equalsIgnoreCase("saving")) {
              s1.deposit();
            } else {
              c1.deposit();
            break;
         case 4:
            if(type.equalsIgnoreCase("saving")) {
              s1.calcInterest();
            } else {
              System.out.println("Service not available");
            break;
```

```
case 5:
            if(type.equalsIgnoreCase("current")) {
               System.out.println("Enter the amount to generate cheque:");
               System.out.println(c1.generateCheque(scan.nextDouble()));
            } else {
               System.out.println("Service not available");
            break;
          case 6:
            if(type.equalsIgnoreCase("current")) {
               c1.depositCheque();
            } else {
               System.out.println("Service not available");
            break;
          case 7:
            if(type.equalsIgnoreCase("saving")) {
               System.out.println(s1);
            } else {
               System.out.println(c1);
            break;
          case 8:
            System.out.println("Exiting the program.");
            scan.close();
            return;
          default:
            System.out.println("Invalid choice. Please try again.");
class Account {
  String name;
  String type;
  int accno;
  double balance;
  Account() {}
  Account(String name, int accno) {
     this.name = name;
```

```
this.accno = accno;
    this.balance = 0;
  }
  void deposit() {
     Scanner scanner = new Scanner(System.in);
     System.out.println("Enter the amount to deposit:");
    double amount = scanner.nextDouble();
    balance += amount;
    System.out.println("Deposit successful. New balance: " + balance);
  boolean withdraw(double amount) {
    if(balance >= amount) {
       balance -= amount;
       System.out.println("Withdrawal successful. New balance: " + balance);
       return true;
     } else {
       System.out.println("Insufficient balance.");
       return false;
  }
  public String toString() {
    return "Account [name=" + name + ", type=" + type + ", accno=" + accno + ", balance=" +
balance + "]";
}
class CurrentAccount extends Account {
  CurrentAccount() { }
  CurrentAccount(String name, int accno) {
    super(name, accno);
    type = "Current";
  String generateCheque(double amount) {
    return "Cheque generated for Account: " + accno + ", Name: " + name + ", Amount: " + amount;
  }
  void depositCheque() {
    super.deposit();
    System.out.println("Cheque deposited successfully");
  boolean withdraw(double amount) {
```

```
if(super.withdraw(amount)) {
       if(balance < 2000) {
         System.out.println("100 rupees penalty for low balance");
       return true;
    return false;
class SavingAccount extends Account {
  SavingAccount() { }
  SavingAccount(String name, int accno) {
    super(name, accno);
    type = "Saving";
  }
  void calcInterest() {
    double interest = balance * 0.05;
    System.out.println("Interest: " + interest + " has been deposited in your account");
    balance += interest;
  }
```

Output:

Eught"
enter the type its apparent (Saving/Current)
- Server State of the server o
Enter your choice
Talanus to
~ .
1. Corate Account
2. Witholian
3 Deposit
4. Palculate Interest &
5 Generate cheque
6. Deposit cheque
a Deposit carque
7- Show balance
0 0:1
8. Exit
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I Callolina L
To Aldelina de a
Enter the name:
- Humli 24 Rosen
Bharya
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the account number:
Enter the account number:
1/10
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Enter your Choice:
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The Company
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amount to cleansit:
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Deposit successful New balance lavos.
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Account name
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9935.0)
Enter your choice
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Program 7: Package Algorithm:

Algorithm:			
		Trape do	5/1/2
package CIE;			TOURS .
public class	-		
el stains	Student &		000
the int se	m; name;		Side.
eado public	Studenti		6000
nam	2 1 1 1 1 1 1 1 1	ing ven	
100000000000000000000000000000000000000	student (sto	5-0-	Stoing
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			100
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1 2000			
The state of the s	- 6		
1: (" alterate " ) 1	the projection		
package SEE;	a mode.		
import CIE. Stuck	1 100		
public class	ent;		
public class	External		
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public Ex	tomal ( )	mil	13:
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int sem	int[] maxl	co/c '	- Gume
		5)	
(9)2	per (usn, n	ame, s	em).
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		2).	
Hall took of Billiam	, , ,	, , );	
3 January 11	LETTO TONI		
3	D		
	10%	-	

impost CIE\*; import java util to; public class main & public static void main (Stoing[] Streep scannes se - new Scanner (systemin) system out point ("Enter The nu of Students:"); int n = sc. next Int(); Student () students = new stude Internals () internals = new Internals ( External = new External [] for (inti=o; ixn; i++) ? system out point by "Enter details goo student" + (i+1); system out pointly (" USN:"); stoing usn = sc. next(); system out point (" Semester" int sem = next Int (); student (i) = new Student us name, usn); system out pointly (" Enter 5 Internal marks !"); int () internal marks = newint for (int j=0; j(5; j+1) internal internal marks (i) = 80. next In internals[i] = new Internals (internal marks);

```
systemout printly ("enter 5 SEE

int () see marks - new int (5);

for (int j = 0; jes; j++) see marks

externals[i] - new External (ush,

name, semm mema, seemaks);

system out printly ("final marks of each

stuclent in 5 courses:");

for (int j = 0; icn; i++) &

system out printly ("Student"

+ (i+1) + ":" + student [i] name);

int final marks[j] + external

(i) see marks[j];

system out paintly ("course"

+ (j+1) + ":" + final mark);

3

3
```

```
Code:
package CIE;
public class Student {
  String usn, name;
  int sem;
  public Student(String usn, String name, int sem) {
     this.usn = usn;
     this.name = name;
     this.sem = sem;
public class Internals {
  int[] internalMarks = new int[5];
  public Internals(int[] marks) {
     System.arraycopy(marks, 0, internalMarks, 0, 5);
}
package SEE;
import CIE.Student;
public class External extends Student {
  int[] seeMarks = new int[5];
  public External(String usn, String name, int sem, int[] marks) {
     super(usn, name, sem);
     System.arraycopy(marks, 0, seeMarks, 0, 5);
  }
```

```
}
import CIE.*;
import SEE.*;
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();
     Student[] students = new Student[n];
     Internals[] internals = new Internals[n];
     External[] externals = new External[n];
     for (int i = 0; i < n; i++) {
       System.out.println("Enter details for student " + (i + 1));
       System.out.print("USN: ");
       String usn = sc.next();
       System.out.print("Name: ");
       String name = sc.next();
       System.out.print("Semester: ");
       int sem = sc.nextInt();
       students[i] = new Student(usn, name, sem);
       System.out.print("Enter 5 internal marks: ");
       int[] internalMarks = new int[5];
       for (int j = 0; j < 5; j++) internalMarks[j] = sc.nextInt();
       internals[i] = new Internals(internalMarks);
       System.out.print("Enter 5 SEE marks: ");
       int[] seeMarks = new int[5];
       for (int j = 0; j < 5; j++) seeMarks[j] = sc.nextInt();
       externals[i] = new External(usn, name, sem, seeMarks);
     System.out.println("Final marks of each student in 5 courses:");
     for (int i = 0; i < n; i++) {
       System.out.println("Student" + (i + 1) + ":" + students[i].name);
       for (int j = 0; j < 5; j++) {
          int finalMark = internals[i].internalMarks[j] + externals[i].seeMarks[j];
          System.out.println("Course" + (j + 1) + ":" + finalMark);
       }
     }
  }
```

## Output:

Output
22/2 miles" Johning to a make ye
Enter no of student & I
12 1 Usn: 23 0 993 (Stri
Name: Deepak
Semi (1) 3 1 13 1 2 1 1
orternals 17 = new External lune
Enter marks of 5 Subject internal
80 70 75 80 65
Enter moosks of 5 subject externel
50 60 70 80 80
- (++i : resi : o si fai ) so
final masks
Name: Deepsk
Usn+1: 230 hi:
good son it is a
of mark internal 60 70 80 90 100
50 106

Program 8: Interface Algorithm:

impost java. util. scan	nes;
intexface Polygon &	colored a color
default double sides) E	get Perim eter (cloubles)
	ble side: sides) &
pez	imeter += side;
3	tasmuss h water
3	perimeter;
double get Asea	D; musel
3	
in the Course seemed their	a last sens avad acrit
class Rectangle imp	dements Polygon &
poivate double	clength,
private double	width;
public Rectangle	( clouble length, double with
This bength =	croune length, double wis
This width =	length;
3 transland tout	Amounty Da moter
public double on	at Complete
return la	get Area () E
3	9th * width;
3	

Deep 100/YA
class Moiangle implements Polygon &  private clouble base:
private clouble base;
private clouble base:
private alouble base;
facility of double 1
height) & this base - base;
This base - base;
this base = base; this height = beight;
states to a manus o tapinhiat alduate
orange o talpinkish alduah
public double get Aseals &
> seturn o.5 * base * height:
3  3  3  1  1  1  1  1  1  1  1  1  1  1
all althoughton making
110 march 201 No. 20 No. 20 No. 201
Diplic class 2
public static void main ( 84: 52 )
Scanner (scanner (stronge) aggs) &
public static void main ( Stoing () augs) E Scanner scanner = new Scanner (systemin);
system out pointln (" Enter the length
abuble rectionation
Double O;
doi No de de de la late
double rectivienth = scanner-next
Doubleu;
coording an Rectangle rect = new Rectangle
bject (rectlength, rectwidth);
system.out.pointln ("Enter the
Cour sides of the Rectangle!);
double [] rectsides = new doublety;
for (int i=0 ; i < 4; i +++) &
rect cides (i) = scanner.
next Double();
2

```
system out pointln (" Rectangle Perin + rect get Perinneter ( rect side
  system out point In ("Rectangle Asso
     + rectiget Area (s);
 system. out point In ( " Enter The
  and height of the triangle:
  double toilBase = Scannes next
  double toitleight = scannes nest Doub
 Triangle toi = new Triangle (toil
    tritleight);
 system out point In ("Enter the
          sides of the toiangle.
   double [] toi sides = news
     double (3);
   for (int i=0; ix 3; i++) &
     toi Sicles[i] = scannes nex
system out point In ("Toiangle
Perimeter: " + taiget Perimeter
 (taisides));
          + toi-get Ascal);
```

```
Code:
import java.util.Scanner;
interface Polygon {
    default double getPerimeter(double[] sides) {
        double perimeter = 0;
        for (double side : sides) {
            perimeter += side;
        }
        return perimeter;
}
```

```
double getArea();
class Rectangle implements Polygon {
  private double length;
  private double width;
  public Rectangle(double length, double width) {
     this.length = length;
     this.width = width;
  }
  public double getArea() {
     return length * width;
  }
}
class Triangle implements Polygon {
  private double base;
  private double height;
  public Triangle(double base, double height) {
     this.base = base;
     this.height = height;
  }
  public double getArea() {
     return 0.5 * base * height;
  }
}
public class Perimeter {
  public static void main(String[] args) {
     Scanner scanner = new Scanner(System.in);
     System.out.println("Enter the length and width of the rectangle:");
     double rectLength = scanner.nextDouble();
     double rectWidth = scanner.nextDouble();
     Rectangle rect = new Rectangle(rectLength, rectWidth);
     System.out.println("Enter the four sides of the rectangle:");
     double[] rectSides = new double[4];
     for (int i = 0; i < 4; i++) {
       rectSides[i] = scanner.nextDouble();
     System.out.println("Rectangle Perimeter: " + rect.getPerimeter(rectSides));
```

```
System.out.println("Rectangle Area: " + rect.getArea());

System.out.println("Enter the base and height of the triangle:");
double triBase = scanner.nextDouble();
double triHeight = scanner.nextDouble();

Triangle tri = new Triangle(triBase, triHeight);
System.out.println("Enter the three sides of the triangle:");
double[] triSides = new double[3];
for (int i = 0; i < 3; i++) {
    triSides[i] = scanner.nextDouble();
}
System.out.println("Triangle Perimeter: " + tri.getPerimeter(triSides));
System.out.println("Triangle Area: " + tri.getArea());
scanner.close();
}</pre>
```

Output

Enter the length and wichth of the rectangle

Penter the four eicles of the rectangle

In to 10 10 10

Rectangle Perimeter: 40

Rectangle Area: 140

Enter the base and height of a triangle:

Triangle Perimeter: 30

Triangle Area: 70

Program 9: Father and Son Exception Algorithm:

emport java util +;
Class M-:
public static mil
public static void main ( stoing aggs[) [
susten sub- sill " Systemin
and father's detail's);
Sun 2 = 122 8 (
Son 8= new Son (scan hext(), scan next Int(), scan next(),
3can. next Int());
do altere 3
7: Jan Brig two motors
and
Class fother &
Stoing name; intage;
futher (String name, intage) &
this hame = name;
toy E
if (age > o) E
this age = age;
( 550 1:01")
age is ralid";
system out printly "father age is valid";  3 else E

thrown new woungage (age). catch (woungage e) & system out pointln(e); system out pointle ("Negartine father's age"); Class Son extends father & son ( stoing name, intage, stoing fathername, int fatherage) & super (father name, fatherage) if (age >= oldage ( father age this age - age; system out pointln (" so age is valid"); 3 alse E throw new wrong Age 3 catch ( wrong Age e) & "Negative exsor": "sun age cannot be more to the father").

class wrong Age extends exception &
int age;
wrong age (int age) &
this age = age;

public String to String &
seturn "invalid age" tage;

```
Code:
import java.util.*;
class Main{
public static void main(String args[]){
Scanner scan = new Scanner(System.in);
System.out.println("enter the son's and father's details");
Son s=new Son(scan.next(),scan.nextInt(),scan.next(),scan.nextInt());
}
class Father{
String name; int age;
Father(String name, int age){
this.name=name;
try{
if(age>0){
this.age=age;
System.out.println("father age is valid");
}else{
throw new WrongAge(age);
}catch(WrongAge e){
System.out.println(e);
System.out.println("negative fathers age");
}
class Son extends Father{
Son(String name, int age, String fathername, int fatherage)
super(fathername,fatherage);
try{
if(age>=0 && age<fatherage){
this.age=age;
System.out.println("son age is valid");
}else{
throw new WrongAge(age);
}catch(WrongAge e){
System.out.println(e);
System.out.println(age<0? "negative error" : "sons age cannot be more than the fathers");
}
class WrongAge extends Exception{
int age;
WrongAge(int age){
```

```
this.age=age;
}
public String toString(){
return "invalid age "+age;
}
}
```

Output:

Output:	
Enter the surio	s and fathers's clefail
dem	
12	
Korshing	
48	
father age is	valid
7	valid

Program 10: Thread Program Algorithm:

import java util \*; public class Threadmorad Class Bm & colleage Textends Thread & public void oun () E while (toue) & system. out. pointlin (" Bms college of Engineering"): 3 catch (Intersupted Expreption ie ) & systemout pointln " Thread interoupted: " + ie); 3 Clays CSE Thread extends Thread & public roid runly 3 catch ( Introsupted Exteption ie) system outpointly "Thread intero public class my Thread & public static voice main (String [) BM& Colleage Thread & DI = new BMSCollege Thread (); CCF Threach & = new COF Th e. start U; to Start ();

## Code:

```
class BMSCollegeThread extends Thread {
  public void run() {
    while (true) {
       System.out.println("BMS College of Engineering");
         Thread.sleep(10000);
       } catch (InterruptedException ie) {
         System.out.println("Thread interrupted: " + ie);
    }
  }
class CSEThread extends Thread {
  public void run() {
    while (true) {
       System.out.println("CSE");
       try {
         Thread.sleep(2000);
       } catch (InterruptedException ie) {
         System.out.println("Thread interrupted: " + ie);
    }
  }
public class MyThread {
  public static void main(String[] args) {
    BMSCollegeThread t1 = new BMSCollegeThread();
    CSEThread t2 = new CSEThread();
    t1.start();
    t2.start();
  }
```

## Output:

