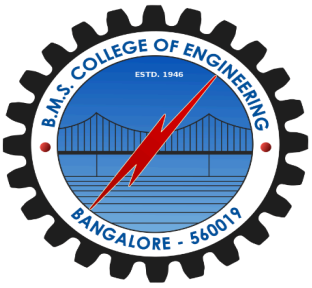
B.M.S. COLLEGE OF ENGINEERING

(Autonomous College Affiliated to Visvesvaraya Technological University, Belgaum) Bull Temple Road, Basavanagudi, Bengaluru – 560019



LAB REPORT

On

Object Oriented Java Programming

(23CS3PCOOJ)

Submitted By :

Vignesh B

1BM22CS326

In partial fulfilment of

BACHELOR OF ENGINEERING

In

COMPUTER SCIENCE AND ENGINEERING

2023-24

B.M.S. COLLEGE OF ENGINEERING

(Autonomous College Affiliated to Visvesvaraya Technological University, Belgaum)
Bull Temple Road, Basavanagudi, Bengaluru – 560019

Department of

Computer Science & Engineering (CSE)

CERTIFICATE

This is to certify that the Lab work entitled "Object Oriented Programming in Java (23CS3PCOOJ)" conducted by **Vignesh B (1BM22CS326),** who is bonafide student at **B.M.S.College of Engineering**. It is in partial fulfilment for the award of **Bachelor of Engineering in Computer Science and Engineering** during the academic year 2023-24. The Lab report has been approved as it satisfies the academic requirements in respect of Object Oriented Programming in Java (22CS3PCOOJ) work prescribed for the said degree.

Vignesh B
1BM22CS326

Sneha S Bagalkot
Assistant Professor
Department of CSE
BMSCE, Bengaluru-19

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PROGRAM 1:

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

```
import java.util.Scanner;
import java.lang.Math;
class quadratic
{
public static void main(String agrs[])
 {
   int a,b,c;
   System.out.println("enter the values of a,b,c respectively\n");
   Scanner s1= new Scanner(System.in);
   a = s1.nextInt();
   b = s1.nextInt();
   c = s1.nextInt();
   double d= b*b - 4*a*c ;
   System.out.println("a = " + a +" b = " + b +" c = " + c);
   if(a==0) {System.out.println("not a quadratic equation");}
   else if( d>0)
   {
    System.out.println("the equation has two real and different solutions");
    double r1=(-b + Math.sqrt(d))/(2*a);
    double r2=(-b - Math.sqrt(d))/(2*a);
    System.out.println("r1 = " + r1);
    System.out.println("r2 = " + r2);
   }

  else if(d==0)
   {
    System.out.println("the equation has real and equal solutions");
    double r1= -b/(2*a);
    double r2= -b/(2*a);
    System.out.println("r1 = " + r1);
    System.out.println("r2 = " + r2);
   }

  else if(d<0)
   {
    System.out.println("the equation has unreal solutions");
   }
 }

}
```

OUTPUT:

```
Enter the coefficients
10 4 15
Roots are imaginary     0.0-i1.2083045973594573  and     0.0+i1.2083045973594573
PS E:\javacodes> java QuadMain
Enter the coefficients
3 9 3
Roots are real and distinct
Roots are-3.437694101250946 -23.562305898749052
PS E:\javacodes>
```

PROGRAM 2:

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 the percentage of a student.

```
import java.util.Scanner;
class Student{
   String usn;
   String name;
   int marks[]= new int[6];

   void Details()
   {
Scanner s=new Scanner(System.in);
System.out.println("Enter USN");
usn=s.next();
System.out.println("Enter Name");
name=s.next();
System.out.println("Enter marks for 6 subjects:");
for(int i = 0; i < 6; i++)
{
System.out.print("Subject " + (i + 1) + ": ");
marks[i]=s.nextInt();
}
   }
   double percentage()
   {
int total=0;
for(int i=0;i<6;i++)
{
total+=marks[i];
}
double p=total/6;
return p;
   }
```

```
  void display()
  {
System.out.println("\nStudent Details:");
      System.out.println("USN: " + usn);
      System.out.println("Name: " + name);
      System.out.println("Marks:");
      for(int i = 0; i < 6; i++)
      {
System.out.println("Subject " + (i + 1) + ": " + marks[i]);
      }
      System.out.println("Percentage: "+ percentage() + "%");
  }
}
class Lab1student
{
public static void main(String args[]){
Scanner s = new Scanner(System.in);
System.out.print("Enter the number of students: ");
int n = s.nextInt();
Student[] students = new Student[n];
for (int i = 0; i < n; i++)
{
students[i] = new Student();
System.out.println("\nEnter details for Student " + (i + 1) + ":");
students[i].Details();
}
for (Student student : students)
{
student.display();
}
}
}
```

OUTPUT:

```
Enter the total number of students:
1

Student details 1:
Enter USN:
1234
Enter Name:
90
Enter Marks of 6 subjects:

Marks of Subject 1:
93

Marks of Subject 2:
95

Marks of Subject 3:
80

Marks of Subject 4:
98

Marks of Subject 5:
89

Marks of Subject 6:
98
```

```
Details of Students:

Student Details:
USN: 1234
Name: 90
Marks:
Subject 1: 93
Subject 2: 95
Subject 3: 80
Subject 4: 98
Subject 5: 89
Subject 6: 98
Percentage: 92.17%
```

PROGRAM 3:

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 Books {
   String Name;
   String Author;
   int price;
   int numPages;

   Books(String Name, String Author, int price, int numPages) {
      this.Name = Name;
      this.Author = Author;
      this.numPages = numPages;
      this.price = price;
   }

   public String toString() {
      String name, Author, price, numPages;
      name = "Book name: " + this.Name + "\n";
      Author = "Author name: " + this.Author + "\n";
      numPages = "Number of pages: " + this.numPages + "\n";
      price = "Price: " + this.price + "\n";
      return name + Author + numPages + price;
   }
}

class BooksMain {
   public static void main(String[] args) {
      Scanner s = new Scanner(System.in);
      int n;
      String Name;
      String Author;
      int price;
      int numPages;
      System.out.println("Name: Vignesh B");
      System.out.println("USN: 1BM22CS326");
      System.out.println("Enter the number of books");
      n = s.nextInt();
      Books b[] = new Books[n];

      for (int i = 0; i < n; i++) {
```

```
            System.out.println("Book " + (i+1) + " Details: ");
            System.out.println("Enter name of book: ");
            Name = s.next();
            System.out.println("Enter name of Author: ");
            Author = s.next();
            System.out.println("Enter price: ");
            price = s.nextInt();
            System.out.println("Enter number of Pages: ");
            numPages = s.nextInt();

            b[i] = new Books(Name, Author, price, numPages);
        }

        for (int i = 0; i < n; i++) {
            System.out.println("Books " + (i + 1) + "\n");
            System.out.println(b[i].toString());
        }
    }
}
```

OUTPUT:

```
PS E:\javacodes> java BooksMain
Name: Vignesh B
USN: 1BM22CS326
Enter the number of books
2
Book 1Details:
Enter name of book:
Secret
Enter name of Author:
Anonymous
Enter price:
100
Enter number of Pages:
200
Book 2Details:
Enter name of book:
Love
Enter name of Author:
Romeo
Enter price:
200
Enter number of Pages:
340
Books 1

Book name: Secret
Author name: Anonymous
Number of pages: 200
Price: 100

Books 2

Book name: Love
Author name: Romeo
Number of pages: 340
Price: 200
```

PROGRAM 4:

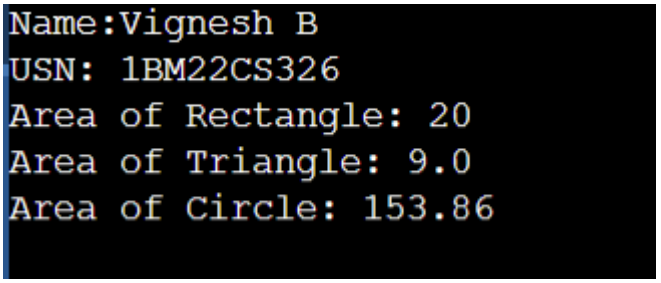
Develop a Java program to create an abstract class named Shape that contains two integers and an empty method named printArea( ). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contain only the method printArea(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

```
abstract class Shape {
protected int dimension1;
protected int dimension2;
public Shape(int dimension1, int dimension2) {
this.dimension1 = dimension1;
this.dimension2 = dimension2;
}
public abstract void printArea();
}
class Rectangle extends Shape {
public Rectangle(int length, int width) {
super(length, width);
}
public void printArea() {
int area = dimension1 * dimension2;
System.out.println("Area of Rectangle: " + area);
}
}
class Triangle extends Shape {
public Triangle(int base, int height) {
super(base, height);
}
public void printArea() {
double area = 0.5 * dimension1 * dimension2;
```

```
System.out.println("Area of Triangle: "+ area);
}
}
class Circle extends Shape {
public Circle(int radius) {
super(radius, 0);
}
public void printArea() {
double area = 3.14* dimension1 * dimension1;
System.out.println("Area of Circle: " + area);
}
}

public class ShapeMain {
public static void main(String[] args) {
System.out.println("Name:Vignesh B");
System.out.println("USN: 1BM22CS326");
Rectangle rectangle = new Rectangle(4, 5);
rectangle.printArea();
Triangle triangle = new Triangle(3, 6);
triangle.printArea();
Circle circle = new Circle(7);
circle.printArea();
}
}
```

OUTPUT:



PROGRAM 5:

Develop a Java program to create a class Bank that maintains two kinds of account for its customers, one called a 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 a 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 deposits from customers 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 a penalty if necessary and update the balance.

```
class Bank {
public static void main(String[] args) {
SavingsAccount savingsAccount = new SavingsAccount("John Doe", "SA1001");
CurrentAccount currentAccount = new CurrentAccount("Jane Smith", "CA2002");
System.out.println(“Name:Vignesh B”);
System.out.println(“USN: 1BM22CS326”);
savingsAccount.deposit(5000);
savingsAccount.displayBalance();
savingsAccount.computeInterest();
savingsAccount.displayBalance();
savingsAccount.withdraw(2000);
savingsAccount.displayBalance();
```

```
currentAccount.deposit(8000);
currentAccount.displayBalance();

currentAccount.withdraw(5000);
currentAccount.displayBalance();
}
}
class Account {
protected String customerName;
protected String accountNumber;
protected double balance;
public Account(String customerName, String accountNumber) {
this.customerName = customerName;
this.accountNumber = accountNumber;
this.balance = 0;
}
public void deposit(double amount) {
balance += amount;
System.out.println("Deposit of " + amount + "successful");
}
public void displayBalance() {
System.out.println("Account Number"+ accountNumber + "\nBalance: "+ balance);
}
}
class SavingsAccount extends Account {
public SavingsAccount(String customerName, String accountNumber) {
super(customerName, accountNumber);
}
public void computeInterest() {
double interestRate = 0.05;
double interest = balance * interestRate;
balance += interest;
```

```
System.out.println("Interest of "+ interest + "computed and added to the balance. ");
}
public void withdraw(double amount) {
if (balance >= amount) {
balance -= amount;
System.out.println("Withdrawal of " + amount + "successful");
} else {
System.out.println("Insufficient funds for withdrawal");
}
}
}
class CurrentAccount extends Account {
private double minimumBalance = 1000;
public CurrentAccount(String customerName, String accountNumber) {
super(customerName, accountNumber);
}
public void withdraw(double amount) {
if (balance - amount >= minimumBalance) {
balance -= amount;
System.out.println("Withdrawal of "+ amount + "successful. ");
} else {
System.out.println("Insufficient funds. Service charge applied");
imposeServiceCharge();
}
}
private void imposeServiceCharge() {
double serviceCharge = 20;
balance -= serviceCharge;
System.out.println("Service charge of " + serviceCharge + " imposed. ");
}
}
```

OUTPUT:

```
PS E:\javacodes> javac Bank.java
PS E:\javacodes> java Bank
Name:Vignesh B
USN: 1BM22CS326
Deposit of 5000.0successful
Account NumberSA1001
Balance: 5000.0
Interest of 250.0computed and added to the balance.
Account NumberSA1001
Balance: 5250.0
Withdrawal of 2000.0successful
Account NumberSA1001
Balance: 3250.0
Deposit of 8000.0successful
Account NumberCA2002
Balance: 8000.0
Withdrawal of 5000.0successful.
Account NumberCA2002
Balance: 3000.0
PS E:\javacodes>
```

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.

Cie folder:

Internals:

```
package cie;
public class Internals extends Student{
public int[] marks=new int[5];
```

```
}
```
Student:

```
package cie;
public class Student{
public String name;
public String usn;
public int sem;
}
```

See folder:

```
package see;
import cie.Student;
public class External extends Student{
public int[] seemarks=new int[5];
}
```
Main :

```
import cie.Internals;
import see.External;
import java.util.Scanner;

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

        Internals[] s1 = new Internals[n];
        External[] s2 = new External[n];
        int[] finalcie = new int[n];
        int[] finalsee = new int[n];

        for (int i = 0; i < n; i++) {
```

```
    s1[i] = new Internals();
    System.out.println("Enter the name");
    s1[i].name = input.next();
    System.out.println("Enter the usn");
    s1[i].usn = input.next();
    System.out.println("Enter the sem");
    s1[i].sem = input.nextInt();
    System.out.println("Enter the marks of 5 subjects");
    for (int j = 0; j < 5; j++) {
        s1[i].marks[j] = input.nextInt();
        finalcie[i] += s1[i].marks[j];
    }
}

for (int i = 0; i < n; i++) {
    s2[i] = new External();
    System.out.println("Enter the name");
    s2[i].name = input.next();
    System.out.println("Enter the usn");
    s2[i].usn = input.next();
    System.out.println("Enter the sem");
    s2[i].sem = input.nextInt();
    System.out.println("Enter the marks of 5 subjects");
    for (int j = 0; j < 5; j++) {
        s2[i].seemarks[j] = input.nextInt();
        finalsee[i] += s2[i].seemarks[j];
    }
}

System.out.println("Final marks:");
for (int i = 0; i < n; i++) {
```

```
            System.out.println("Name: " + s1[i].name + " USN: " + s1[i].usn + " Sem: " +
s1[i].sem);
            System.out.println("Internal marks: " + finalcie[i]);
            System.out.println("External marks: " + finalsee[i]);
            System.out.println("Total marks: " + (finalcie[i] + finalsee[i]));
        }
    }
}
```

OUTPUT:

```
Enter the number of students:
1
Enter the name:
Krishna
Enter the usn:
1BM22CS290
Enter the sem:
3
Enter the marks of 5 subjects:
44
44
44
44
44
Enter the name
Krishna
Enter the usn
1BM22CS290
Enter the sem
3
Enter the marks of 5 subjects
44
45
46
47
48
Final marks:
Name: Krishna USN: 1BM22CS290 Sem: 3
Internal marks: 220
External marks: 230
Total marks: 450
```

PROGRAM 7:

Write a program that demonstrates handling of exceptions in inheritance trees.

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 cases both father and son's age and throws an exception if son's age is >father's age.

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

class Father {
  int age;

   public Father(int age) throws WrongAge {
      if (age < 0) {
         throw new WrongAge("Age cannot be negative");
      }
      this.age = age;
   }

   public int getAge() {
      return age;
   }
}
class Son extends Father {
    int sonAge;

   public Son(int fatherAge, int sonAge) throws WrongAge {
      super(fatherAge);
      if (sonAge >= fatherAge) {
         throw new WrongAge("Son's age cannot be greater than or equal to father's age");
      }
      this.sonAge = sonAge;
   }

   public int getSonAge() {
      return sonAge;
   }
}

public class Main {
   public static void main(String[] args) {
      try {
         System.out.println("Name: Vignesh B");
         System.out.println("USN: 1BM22CS326");
         Father father = new Father(45);
         System.out.println("Father's age: " + father.getAge());
```

```
            Son son = new Son(45, 50); // This will throw an exception
            System.out.println("Son's age: " + son.getSonAge());
             }


catch (WrongAge e) {
            System.out.println("Exception caught: " + e.getMessage());
        }
    }
}
```

OUTPUT:

```
Name: Vignesh B
USN: 1BM22CS326
Father's age: 45
Exception caught: Son's age cannot be greater than or equal to father's age


...Program finished with exit code 0
Press ENTER to exit console.
```

PROGRAM 8:

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 DispMessage extends Thread {
    String message;
   int interval; // Interval in milliseconds

    public DispMessage(String message, int interval) {
        this.message = message;
        this.interval = interval;
    }

    public void run() {
        while (true) {
            System.out.println(message);
            try {
                Thread.sleep(interval);
            } catch (InterruptedException e) {
                e.printStackTrace();
            }
        }
    }
```

```
}
public class Main {
    public static void main(String[] args) {
    System.out.println("Name: Vignesh B");
    System.out.println("USN: 1BM22CS326");
    DispMessage bmsThread = new DispMessage("BMS College of Engineering", 10000);
    DispMessage cseThread = new DispMessage("CSE", 2000);

    bmsThread.start();
    cseThread.start();
    }
}
```

OUTPUT:

```
Name: Vignesh B
USN: 1BM22CS326
BMS College of Engineering
CSE
CSE
CSE
CSE
CSE
BMS College of Engineering
CSE
CSE
CSE
CSE
CSE
BMS College of Engineering
CSE
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```