VISVESVARAYA TECHNOLOGICAL UNIVERSITY

"JnanaSangama", Belgaum -590014, Karnataka.

LAB REPORT
on

Object Oriented Java Programming

(22CS3PCOOJ)

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

B.M.S. COLLEGE OF ENGINEERING
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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(22CS3PCOOJ)" carried out by **AYMAN KHAN(1BM22CS062),** 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 during the year 2022. The Lab report has been approved as it satisfies the academic requirements in respect of a Object Oriented Java Programming (22CS3PCOOJ) work prescribed for the said degree.

`

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LAB 1

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

```
import java.util.Scanner;

class quadratic
{
    double a,b,c,d;
    Scanner s= new Scanner(System.in) ;
    void input(){

    a=s.nextDouble();
    b=s.nextDouble();
    c=s.nextDouble();
    }
    void calculate()
    {
        if(a==0)
        {
            System.out.println( "Not a quadratic equation");
            return;
        }
        d= (b*b)-(4*a*c);
        if(d==0)
        {
            double r1 = -b/2*a;
            System.out.println("Roots are real and equal");
            System.out.println("r1=r2=" + (float)r1);
        }
        if(d<0)
        {
            double r1 = -b/2*a;
            double r2 = (Math.sqrt(Math.abs(d)))/2*a;
            System.out.println("Roots are imaginary");
            System.out.println("r1=" + (float)r1 + "r2=" +(float)r2 );
        }
        if(d>0)
        {
            double r1 = -b+  Math.sqrt(d)/2*a;
            double r2 = -b-  Math.sqrt(d)/2*a;
            System.out.println("The roots are real and different");
            System.out.print("r1=" + (float)r1+"\n"+"r2="+(float)r2);
        }
    }
}
public class lab1{
    public static void main(String args[])
    {
        quadratic exp1 = new quadratic();
        exp1.input();
        exp1.calculate();
    }
```

}

OUTPUT:-

```
PS C:\Users\PC\OneDrive\Desktop\java programs> cd "c:\Users\PC\OneDrive\Desktop\java programs\" ; if ($?) { javac lab1.java } ; if ($?) { java lab1 }
1 2 1
Roots are real and equal
r1=r2=-1.0
PS C:\Users\PC\OneDrive\Desktop\java programs> cd "c:\Users\PC\OneDrive\Desktop\java programs\" ; if ($?) { javac lab1.java } ; if ($?) { java lab1 }
5 4 5
Roots are imaginary
r1=-10.0r2=22.912878
PS C:\Users\PC\OneDrive\Desktop\java programs> cd "c:\Users\PC\OneDrive\Desktop\java programs\" ; if ($?) { javac lab1.java } ; if ($?) { java lab1 }
1 -3 2
The roots are real and different
r1=3.5
r2=2.5
```

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LAB 2

Write a JAVA program to create class Student with members USN, Name, Marks and include methods for input, calculate, percentage and display of student details.

```java
import java.util.Scanner;

class Student {
    String USN;
    String Name;
    int marks[] = new int[6];
    Scanner s = new Scanner(System.in);
    void setMarks() {
        for (int i = 0; i < marks.length; i++) {
            System.out.println("Enter the mark of subject " + (i + 1));
            marks[i] = s.nextInt();
        }
    }
    void setDetails() {
        System.out.println("Enter the USN");
        USN = s.next();
        System.out.println("Enter the name of student");
        Name = s.next();
        this.setMarks();
    }
    void display() {
        System.out.println("USN = " + USN);
        System.out.println("Name = " + Name);
        System.out.print("Marks in each subjects are : ");
        for (int i = 0; i < marks.length; i++)
            System.out.print(marks[i] + " ");
        System.out.println("\n");
    }
    int calculateTotal() {
        int total = 0;
        for (int i = 0; i < marks.length; i++)
            total += marks[i];
        return total;
    }
    float percent() {
        float percentage;
        int totalMarks = calculateTotal();
        percentage = ((float) totalMarks / 600) * 100;
        return percentage;
    }
}
public class lab2 {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.println("Enter the number of students");
        int numberOfStudents = scanner.nextInt();
        Student[] students = new Student[numberOfStudents];
        scanner.nextLine();
        for (int i = 0; i < numberOfStudents; i++) {
            students[i] = new Student();
            students[i].setDetails();
        }
        for (int i = 0; i < numberOfStudents; i++) {
            students[i].display();
            int totalMarks = students[i].calculateTotal();
            System.out.println("Total marks:" + totalMarks);
            float percentage = students[i].percent();
            System.out.println("Percentage:" + percentage + "%");
        }
    }
}
```

OUTPUT:-

```
Enter the number of students
1
Enter the USN
1BM22CS062
Enter the name of student
AYMAN
Enter the mark of subject 1
90
Enter the mark of subject 2
95
Enter the mark of subject 3
94
Enter the mark of subject 4
98
Enter the mark of subject 5
99
Enter the mark of subject 6
89
USN = 1BM22CS062
Name = AYMAN
Marks in each subjects are : 90 95 94 98 99 89

Total marks:565
Percentage:94.166664%
```

LAB 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 author,book;
    int price,numPages;
    books(String book,String author, int price, int numPages){
        this.book=book;
        this.author=author;
        this.price=price;
        this.numPages=numPages;
    }
       public  String toString(){
        return "Book
Name:"+this.book+"\n"+"Author:"+this.author+"\n"+"Price:"+this.price+"\n"+"Number of
pages:"+this.numPages+"\n";
    }
}
 class lib{
    public static void main(String[] args){
        String author,book;
        int price,numPages;

        int num_book;
        Scanner input=new Scanner(System.in);

        System.out.print("Enter number of books:");
        num_book=input.nextInt();
        System.out.print("\n");

        books b[]=new books[num_book];
        for(int i=0;i<num_book;i++){
            System.out.println("------------------------\nBook "+(i+1)+"\n-------------------
-------");
            input.nextLine();
            System.out.print("Enter the name of book:");
            book=input.nextLine();

            System.out.print("Enter Authors name:");
            author=input.nextLine();
            System.out.print("Enter the price:");
            price=input.nextInt();
            System.out.print("Enter the number of pages:");
            numPages=input.nextInt();

            b[i]=new books(book,author,price,numPages);

        }
        for(int i=0;i<num_book;i++){
            System.out.println("--------------------\nBook "+(i+1)+" details\n---------------
------");

            String a=b[i].toString();
            System.out.println(a);

        }

    }
}
```

OUTPUT:-

```
Enter number of books:1

--------------------------
Book 1
--------------------------
Enter the name of book:Harry Potter
Enter Authors name:JK Rowling
Enter the price:500
Enter the number of pages:762
----------------------
Book 1 details
----------------------
Book Name:Harry Potter
Author:JK Rowling
Price:500
Number of pages:762
```

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LAB 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 print Area( ) that prints the area of the given shape.

```
import java.util.Scanner;

class inputScanner{
    void rec(rectangle ab){
        Scanner input=new Scanner(System.in);
        System.out.println("Enter the dimensions of the rectangle(Length and Breadth):");
        ab.a=input.nextInt();
        ab.b=input.nextInt();
    }

    void tri(triangle ab){
        Scanner input=new Scanner(System.in);
        System.out.println("Enter the dimensions of the triangle(base and height):");
        ab.a=input.nextInt();
        ab.b=input.nextInt();
    }

    void cir(circle ab){
        Scanner input=new Scanner(System.in);
        System.out.println("Enter the dimension of the circle(radius):");
        ab.a=input.nextInt();
    }

}
abstract class shape extends inputScanner{
    int a,b;
    abstract void printArea();
}
class rectangle extends shape{
    rectangle(){
        rec(this);
    }
    void printArea(){
        System.out.println("Area of Rectangle = "+(double)(a*b));
    }
}
class triangle extends shape{
    triangle(){tri(this);}
    void printArea(){
        System.out.println("Area of Triangle = "+(0.5*a*b));
    }
}
class circle extends shape{
    circle(){cir(this);}
    void printArea(){
        System.out.println("Area of Circle = "+(3.14*a*a));
    }
}
class calc{
    public static void main(String[] args){
        rectangle r=new rectangle();
        triangle t=new triangle();
        circle c=new circle();
        r.printArea();
        t.printArea();
        c.printArea();

    }
}
```

OUTPUT:-

```
Enter the dimensions of the rectangle(Length and Breadth):
5 4
Enter the dimensions of the triangle(base and height):
2 3
Enter the dimension of the circle(radius):
5
Area of Rectangle = 20.0
Area of Triangle = 3.0
Area of Circle = 78.5
```

NAME: AYMAN KHAN
USN:1BM22CS062

LAB 5

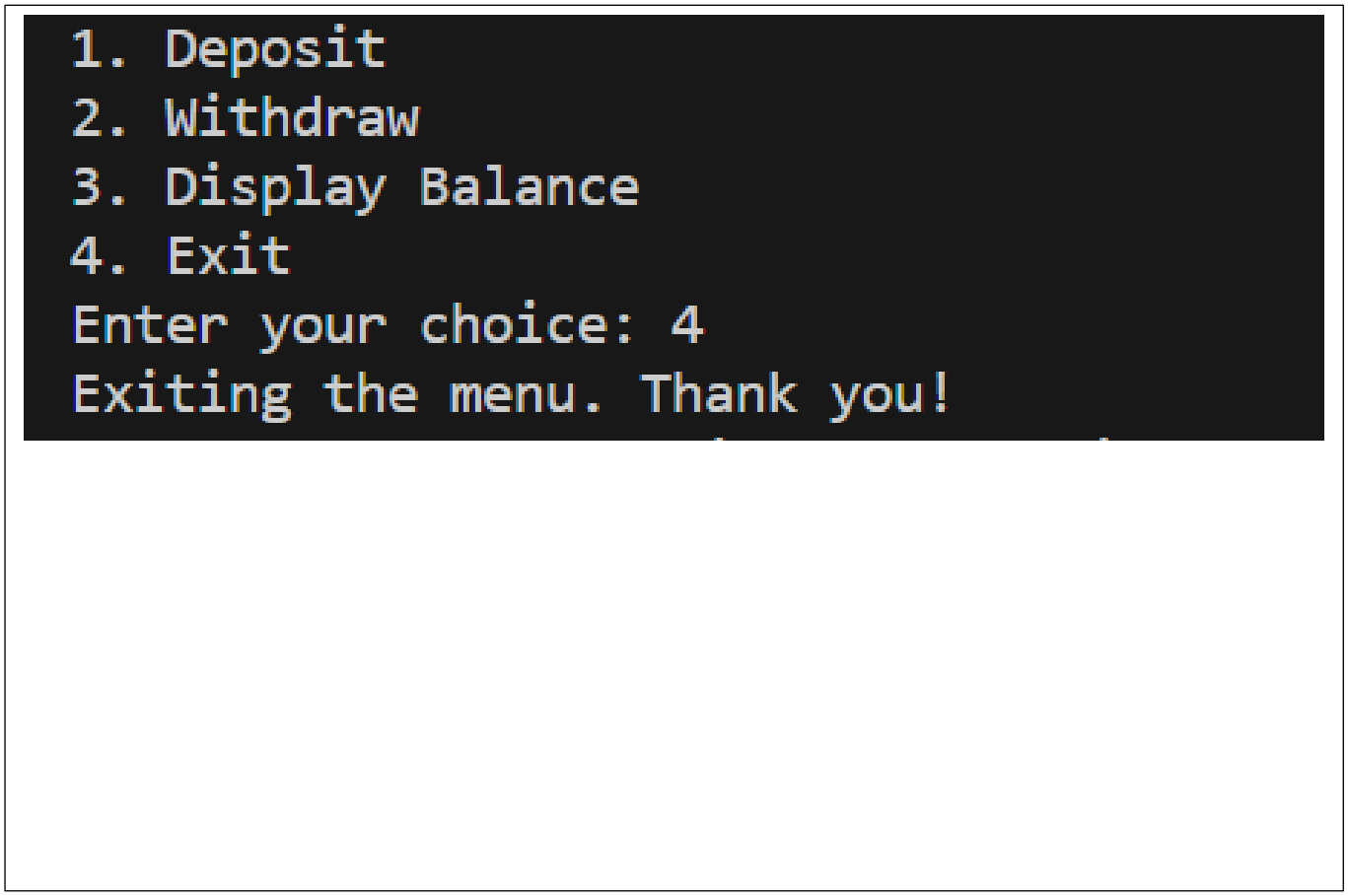
Develop a Java program to create a class Bank that maintains two kinds of account for its customers, one called savings account and the other current account. The savings account provides compound interest and withdrawal facilities but no cheque book facility. The current account provides cheque book 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

```java
import java.util.Scanner;

class Account {
    String name;
    int accountNumber;
    double balance = 0;
    Scanner scanner = new Scanner(System.in);
    Account(String accountType) {
        System.out.println("Creating a new " + accountType + " account");
        System.out.print("Enter name: ");
        this.name = scanner.next();
        System.out.print("Enter account number: ");
        this.accountNumber = scanner.nextInt();
    }
    void deposit() {
        System.out.print("Enter deposit amount: ");
        balance += scanner.nextDouble();
        System.out.println("Deposit successful. Current balance: " + balance);
    }
    void withdraw() {
        System.out.print("Enter withdrawal amount: ");
        double withdrawal = scanner.nextDouble();
        if (withdrawal <= balance) {
            balance -= withdrawal;
            System.out.println("Withdrawal successful. Current balance: " + balance);
        } else {
            System.out.println("Insufficient funds for withdrawal");
        }
    }
    void displayBalance() {
        System.out.println("Current balance: " + balance);
    }
    void performMenuActions() {
        int choice;
        do {
            System.out.println("\n------ MENU ------");
            System.out.println("1. Deposit");
            System.out.println("2. Withdraw");
            System.out.println("3. Display Balance");
            System.out.println("4. Exit");
            System.out.print("Enter your choice: ");
            choice = scanner.nextInt();
            switch (choice) {
                case 1:
                    deposit();
                    break;
                case 2:
                    withdraw();
                    break;
                case 3:
                    displayBalance();
                    break;
```

```
case 4:
                    System.out.println("Exiting the menu. Thank you!");
                    break;
                default:
                    System.out.println("Invalid choice. Please try again.");
            }
        } while (choice != 4);
    }
}

class SavingsAccount extends Account {
    int interestRate = 5;
    SavingsAccount() {
        super("Savings");
    }
    void compoundInterest(int time) {
        balance *= Math.pow((1 + (interestRate / 100.0)), time);
        System.out.println("Compound interest applied. Current balance: " + balance);
    }
}
class CurrentAccount extends Account {
    double overdraftLimit = -100;
    CurrentAccount() {
        super("Current");
    }
    void issueCheque() {
        System.out.print("Enter cheque amount: ");
        double chequeAmount = scanner.nextDouble();
        if (chequeAmount <= balance && (balance - chequeAmount) >= overdraftLimit) {
            balance -= chequeAmount;
            System.out.println("Cheque issued successfully. Current balance: " + balance);
        } else {
            System.out.println("Insufficient funds to issue the cheque");
        }
    }
}
public class bank {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.println("Welcome to the Banking App");
        SavingsAccount savingsAccount = new SavingsAccount();
        CurrentAccount currentAccount = new CurrentAccount();
        Account selectedAccount = null;
        System.out.println("\nSelect an account type:");
        System.out.println("1. Savings Account");
        System.out.println("2. Current Account");
        int accountTypeChoice = scanner.nextInt();
        if (accountTypeChoice == 1) {
            selectedAccount = savingsAccount;
        } else if (accountTypeChoice == 2) {
            selectedAccount = currentAccount;
        } else {
            System.out.println("Invalid choice. Exiting.");
            System.exit(0);
         }
         selectedAccount.performMenuActions();
         scanner.close();
     }
}
```

OUTPUT:-

```
Creating a new Current account
Enter name: Ayman
Enter account number: 5678

Select an account type:
1. Savings Account
2. Current Account
2

------ MENU ------
1. Deposit
2. Withdraw
3. Display Balance
4. Exit
Enter your choice: 1
Enter deposit amount: 300000
Deposit successful. Current balance: 300000.0

------ MENU ------
1. Deposit
2. Withdraw
3. Display Balance
4. Exit
Enter your choice: 2
Enter withdrawal amount: 15000
Withdrawal successful. Current balance: 285000.0

------ MENU ------
1. Deposit
2. Withdraw
3. Display Balance
4. Exit
Enter your choice: 3
Current balance: 285000.0

------ MENU ------
```


1. Deposit
2. Withdraw
3. Display Balance
4. Exit
Enter your choice: 4
Exiting the menu. Thank you!

NAME: AYMAN KHAN
USN : 1BM22CS062

LAB 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.

Student.java

```java
package cie;

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


}
```

Internals. java

```java
package cie;


public class Internals extends Student {

    public int marksInternal[] = new int[5];

}
```

Externals.java

```java
package see;


import cie.Student;


public class Externals extends Student{
    public int marksExternal[] = new int[5];
}
```

Main.java

```java
import cie.*;
import see.Externals;
import java.util.Scanner;


public class Main {
    Run | Debug
    public static void main(String args[]){
        int n ;
        Scanner sc = new Scanner(System.in);
        int[] finalmarks =new int[5];
        System.out.println(x:"Enter the number of students:");
        n=sc.nextInt();
        Externals finalE[] = new Externals[n];
        Internals finalI[] = new Internals[n];

        for (int i = 0; i < n; i++){
            finalE[i] = new Externals();
            finalI[i] = new Internals();
            System.out.println("Enter the name of student"+(i+1));
            finalI[i].usn = sc.next();
            System.out.println("Enter marks obtained in internals for student"  +(i+1)+":-");
            for(int j=0;j<5;j++){
                finalI[i].marksInternal[j]=sc.nextInt();
            }
            System.out.println("Enter marks obtained in externals for student"  +(i+1)+":-");
            for(int j=0;j<5;j++){
                finalE[i].marksExternal[j]=sc.nextInt();
            }
            for(int j=0;j<5;j++){
                finalE[i].marksExternal[j]/=2;
            }
        }
```

```
        System.out.println("\nFinal Marks for " + n + " students:");
        for (int i = 0; i < n; i++) {
            System.out.println("Student " + (i + 1) + " Details:");
            System.out.println("Name: " + finalI[i].name);
            System.out.println("USN: " + finalI[i].usn);
            System.out.println("Semester: " + finalI[i].sem);
            System.out.println(x:"Final Marks:");
            for (int j = 0; j < 5; j++) {
                int totalMarks = finalI[i].marksInternal[j] + finalE[i].marksExternal[j];
                System.out.println("Subject " + (j + 1) + ": " + totalMarks);
            }
            System.out.println();
        }



}
}
```

OUTPUT:-

```
Enter the number of students:
1
Enter the name of student 1
AYMAN
Enter USN of student 1
1BM22CS062
Enter semester of student 1
3
Enter marks obtained in internals for student 1:-
45 44 46 47 49
Enter marks obtained in externals for student 1:-
90 91 94 96 90

Final Marks for 1 students:
Student 1 Details:
Name: AYMAN
USN: 1BM22CS062
Semester: 3
Final Marks:
Subject 1: 90
Subject 2: 89
Subject 3: 93
Subject 4: 95
Subject 5: 94
```

NAME:AYMAN KHAN
USN:1BM22CS062

LAB 7

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

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

class Father {
    Father(int fathersAge) throws WrongAgeException {
        if (fathersAge < 0)
            throw new WrongAgeException("Father's age is not valid");
    }
}
class Son extends Father {
    Son(int fathersAge, int sonsAge) throws WrongAgeException {
        super(fathersAge);
        if (sonsAge >= fathersAge) {
            throw new WrongAgeException("Son's age is not valid");
        } else {
            System.out.println("The father is " + fathersAge + " years old and
the son is " + sonsAge + " years old");
        }
    }
}
public class Age {
    public static void main(String args[])
    {
        try
        {
            Father f = new Father(50);
            Son s =new Son(-1,90);
        }
        catch(WrongAgeException e)
        {
            System.out.println("Exception:  " + e.getMessage());

        }
    }
}
```

OUTPUT:-

```
Exception:  Father's age is not valid
```

NAME:AYMAN KHAN
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LAB 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 One extends Thread
{
    public void run()
    {
        try
        {
            while(true)
            {
                System.out.println("BMS college of engineering");
                Thread.sleep(10000);
            }
        }
        catch(InterruptedException e){
        System.out.println(e);

        }
    }
}
class Two extends Thread
{
    public void run()
    {
        try{
            while(true)
            {
                System.out.println("CSE");
                Thread.sleep(2000);
            }
        }
        catch(InterruptedException e)
        {
            System.out.println(e);
        }
    }
}
class Threadspgm{
    public static void main(String args[]) {
        Thread t1 =new One();
        Thread t2= new Two();
        t1.start();
        t2.start();
    }
}
```

OUTPUT:-

```
BMS college of engineering
CSE
CSE
CSE
CSE
CSE
BMS college of engineering
CSE
CSE
CSE
CSE
CSE
BMS college of engineering
CSE
```