

**VISVESVARAYA TECHNOLOGICAL UNIVERSITY**  
“JnanaSangama”, Belgaum -590014, Karnataka.



**LAB REPORT**  
**on**  
**Object Oriented Java Programming**  
**(23CS3PCOOJ)**

*Submitted by*

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

**B.M.S. COLLEGE OF ENGINEERING**  
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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 **Shashwat D(1BF24CS278)**, who is a 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. The Lab report has been approved as it satisfies the academic requirements in respect of an Object-Oriented Java Programming (23CS3PCOOJ) work prescribed for the said degree.

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Github Link: [https://github.com/shashwatd278/1BF24CS278\\_Java](https://github.com/shashwatd278/1BF24CS278_Java)

## Program 1

### Implement Quadratic Equation

Code:

```
import java.util.Scanner;
import java.lang.Math;
class quadratic{
    public static void main (String args[]){
        int a,b,c;
        int r1,r2,D;
        Scanner in= new Scanner(System.in);
        System.out.println("Enter value for a: ");
        a=in.nextInt();

        System.out.println("Enter value for b: ");
        b=in.nextInt();

        System.out.println("Enter value for c: ");
        c=in.nextInt();

        D=(b*b)-(4*a*c);

        if(a==0){
            System.out.println("Value of a can't be 0!");
        }
        else{
            if(D>0){
                r1 = ((-b)+(int) (Math.sqrt(D)))/(2*a);
                r2 = ((-b)-(int) (Math.sqrt(D)))/(2*a);
                System.out.println("The roots are real "+r1+" and "+r2);
            }
            else if(D==0){
                r1=(-b)/(2*a);
                System.out.println("Roots are real and equal "+r1);
            }
            else{
                r1 = (-b)/(2*a);
                r2 = (int) Math.sqrt(-D)/(2*a);
                System.out.println("Roots are imaginary "+r1+" + "+r2+"i and "+r1+" - "+r2+"i");
            }
        }
    }
}
```

## Output:

```
PS C:\1BF24CS278> cd "c:\1BF24CS278\" ; if ($?) { javac quadratic.java } ; if ($?) { java quadratic }
Enter value for a:
2
Enter value for b:
-4
Enter value for c:
-6
The roots are real 3 and -1
PS C:\1BF24CS278> cd "c:\1BF24CS278\" ; if ($?) { javac quadratic.java } ; if ($?) { java quadratic }
Enter value for a:
1
Enter value for b:
-6
Enter value for c:
9
Roots are real and equal 3
PS C:\1BF24CS278> cd "c:\1BF24CS278\" ; if ($?) { javac quadratic.java } ; if ($?) { java quadratic }
Enter value for a:
1
Enter value for b:
2
Enter value for c:
5
Roots are imaginary -1 + 2i and -1-2i
```

## Program 2

### Implement a GPA calculator

Code:

```
import java.util.Scanner;

class student{
    String name;
    String USN;
    int n;
    int credit[];
    int marks[];
    double totalcredits;
    double totalpoints;
    int gradepoints;
    double sgpa;

    void accept(){
        Scanner sc = new Scanner(System.in);
        System.out.println("Enter Student Name:");
        name=sc.nextLine();
        sc.nextLine();
        System.out.println("Enter Student USN:");
        USN=sc.nextLine();
        sc.nextLine();

        System.out.println("Enter number of subject: ");
        n=sc.nextInt();

        credit=new int[n];
        marks=new int[n];

        for (int i=0; i<n; i++){
            System.out.println("Enter subject "+(i+1)+" details");
            System.out.println("Enter marks.");
            marks[i]=sc.nextInt();
            sc.nextLine();
            System.out.println("Enter credits for the subject:");
            credit[i]=sc.nextInt();
            sc.nextLine();
        }
    }

    void display(){

    }
}
```

```

        System.out.println("Student Details ");
        System.out.println("Student Name : "+name);
        System.out.println("Student USN : "+USN);
    }

void sgpa(){

    for (int i=0; i<n; i++){
        if (marks[i]>=90){
            gradepoints=10;
        }
        else if(marks[i]>=80 && marks[i]<90){
            gradepoints=9;
        }
        else if(marks[i]>=70 && marks[i]<80){
            gradepoints=8;
        }
        else if(marks[i]>=60 && marks[i]<70){
            gradepoints=7;
        }
        else if(marks[i]>=50 && marks[i]<60){
            gradepoints=6;
        }
        else if(marks[i]>=40 && marks[i]<50){
            gradepoints=5;
        }
        else{
            gradepoints=4;
        }

        totalpoints+=gradepoints*credit[i];
        totalcredits+=credit[i];
    }

    sgpa=totalpoints/totalcredits;
    System.out.println("The Sgpa of the student is : "+sgpa);
}

class SGPA{
    public static void main(String args[]) {

        int n = 2;
        student[] students = new student[n];

        for (int i = 0; i < n; i++) {
            System.out.println("\nEnter details for Student " + (i + 1));
            students[i] = new student();
        }
    }
}

```

```

        students[i].accept();
    }

    for (int i = 0; i < n; i++) {
        System.out.println("\nDetails of Student " + (i + 1));
        students[i].display();
        students[i].sgpa();
    }

}

```

## Output:

```

PS C:\JAVA> cd "c:\JAVA\" ; if ($?) { javac SGPA.java } ; if (?) { java SGPA }

Enter details for Student 1
Enter Student Name:
Sam

Enter Student USN:
1BF24CS687

Enter number of subject:
8
Enter subject 1 details
Enter marks:
90
Enter credits for the subject:
4
Enter subject 2 details
Enter marks:
89
Enter credits for the subject:
3
Enter subject 3 details
Enter marks:
77
Enter credits for the subject:
1
Enter subject 4 details
Enter marks:
76
Enter credits for the subject:
1
Enter subject 5 details
Enter marks:
91
Enter credits for the subject:
3
Enter subject 6 details
Enter marks:
90
Enter credits for the subject:
3
Enter subject 7 details
Enter marks:
83
Enter credits for the subject:
1
Enter subject 8 details
Enter marks:
98
Enter credits for the subject:
4

```

```
Enter details for Student 2
Enter Student Name:
Josh

Enter Student USN:
1bf24cs698

Enter number of subject:
8
Enter subject 1 details
Enter marks:
80
Enter credits for the subject:
3
Enter subject 2 details
Enter marks:
90
Enter credits for the subject:
3
Enter subject 3 details
Enter marks:
56
Enter credits for the subject:
1
Enter subject 4 details
Enter marks:
87
Enter credits for the subject:
1
Enter subject 5 details
Enter marks:
92
Enter credits for the subject:
1
Enter subject 6 details
Enter marks:
86
Enter credits for the subject:
3
Enter subject 7 details
Enter marks:
87
Enter credits for the subject:
4
Enter subject 8 details
Enter marks:
91
Enter credits for the subject:
4
```

```
Details of Student 1
Student Details
Student Name : Sam
Student USN : 1BF24CS687
The Sgpa of the student is : 9.6

Details of Student 2
Student Details
Student Name : Josh
Student USN : 1bf24cs698
The Sgpa of the student is : 9.25
```

## Program 3

Java Program to show use of `toString()`

Code:

```
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.price=price;
        this.numpages=numpages;
    }
    public String toString(){
        String name, author, price, numpages;
        name = "\nBook name: " + this.name + "\n";
        author = "Author name: " + this.author + "\n";
        price = "Price: " + this.price + "\n";
        numpages = "Number of pages: " + this.numpages + "\n";
        return name + author + price + numpages;
    }
}
class BookDetails{
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        int n;
        String name;
        String author;
        int price;
        int numpages;
        System.out.println("Number of books to enter: ");
        n=sc.nextInt();
        sc.nextLine();

        books[] b = new books[n];
        for (int i=0; i<n; i++){
            System.out.println("Enter book name: ");
            name=sc.nextLine();
            sc.nextLine();
            System.out.println("Enter author name: ");
            author=sc.nextLine();
        }
    }
}
```

```

sc.nextLine();
System.out.println("Enter book price: ");
price=sc.nextInt();
sc.nextLine();
System.out.println("Enter total number of pages: ");
numpages=sc.nextInt();
sc.nextLine();
b[i]= new books(name,author,price,numpages);
}
for (int i=0; i<n; i++){
    String s="Book "+(i+1)+" details are :" +b[i];
    System.out.println(s);
}
}
}

```

## Output:

```

PS C:\JAVA> cd "c:\JAVA\" ; if ($?) { javac BookDetails.java } ; if ($?) { java BookDetails }
Number of books to enter:
2
Enter book name:
a song of ice & fire

Enter author name:
George R.R

Enter book price:
3000
Enter total number of pages:
2789
Enter book name:
Harry Potter

Enter author name:
JK Rowling

Enter book price:
2800
Enter total number of pages:
2345
Book 1 details are :
Book name: a song of ice & fire
Author name: George R.R
Price: 3000
Number of pages: 2789

Book 2 details are :
Book name: Harry Potter
Author name: JK Rowling
Price: 2800
Number of pages: 2345

```

## Program 4

Java Program to show use of Abstract class

Code:

```
import java.util.Scanner;

abstract class shape{
    int l;
    int b;

    shape(int l, int b){
        this.l=l;
        this.b=b;
    }

    abstract void area();
}

class Rectangle extends shape{
    Rectangle(int l, int b){
        super(l,b);
    }

    void area(){
        System.out.println("Area of Rectangle is "+l*b);
    }
}

class Triangle extends shape{
    Triangle(int l, int b){
        super(l,b);
    }

    void area(){
        System.out.println("Area of Triangle is "+(double)(0.5*l*b));
    }
}

class Circle extends shape{
    Circle(int r){
        super(r,0);
    }

    void area(){

```

```

        System.out.println("Area of Circle is "+(double)(3.14*l*l));
    }
}

class area{
    public static void main(String[] args){
        int l,b,r,d1,d2;
        Scanner s = new Scanner(System.in);
        System.out.println("Enter Dimensions of rectangle: ");
        l=s.nextInt();
        b=s.nextInt();

        System.out.println("Enter Dimensions of triangle: ");
        d1=s.nextInt();
        d2=s.nextInt();

        System.out.println("Enter radius of circle: ");
        r=s.nextInt();

        shape rectangle = new Rectangle(l,b);
        shape triangle = new Triangle(d1,d2);
        shape circle = new Circle(r);

        rectangle.area();
        triangle.area();
        circle.area();
    }
}

```

Output:

```

PS D:\278> cd "d:\278\" ; if ($?) { javac area.java } ; if (?) { java area }
Enter Dimensions of rectangle:
2
3
Enter Dimensions of triangle:
2
4
Enter radius of circle:
3
Area of Rectangle is 6
Area of Triangle is 4.0
Area of Circle is 28.259999999999998

```

## Program 5

### Implementation of Inheritance

Code:

```
import java.util.Scanner;

class Account {
    String name;
    int accNo;
    String accType;
    double balance;

    Account(String name, int accNo, String accType, double balance) {
        this.name = name;
        this.accNo = accNo;
        this.accType = accType;
        this.balance = balance;
    }

    void deposit(double amount) {
        if (amount > 0) {
            balance += amount;
            System.out.println("Updated balance: Rs " + balance);
        } else {
            System.out.println("Invalid deposit amount!");
        }
    }

    void withdraw(double amount) {
        if (amount <= 0) {
            System.out.println("Invalid withdrawal amount!");
            return;
        }
        if (amount > balance) {
            System.out.println("Insufficient balance!");
            return;
        }
        balance -= amount;
        System.out.println("Updated balance: Rs " + balance);
    }

    void computeInterest(int years) {
        System.out.println("Interest not applicable for Current Account.");
    }
}
```

```

void display() {
    System.out.println("\nAccount Holder: " + name);
    System.out.println("Account Number: " + accNo);
    System.out.println("Account Type: " + accType);
    System.out.println("Balance: Rs " + balance);
}
}

class Savings extends Account {
    double interestRate = 0.05;

    Savings(String name, int accNo, double balance) {
        super(name, accNo, "savings", balance);
    }

    void computeInterest(int years) {
        double interest = balance * Math.pow((1 + interestRate), years) - balance;
        balance += interest;
        System.out.println("Interest added: Rs " + interest + "\n Updated balance: Rs " + balance);
    }
}

class Current extends Account {
    double minBalance = 1000;
    double serviceCharge = 100;

    Current(String name, int accNo, double balance) {
        super(name, accNo, "current", balance);
    }

    void withdraw(double amount) {
        super.withdraw(amount);
        if (balance < minBalance) {
            balance -= serviceCharge;
            System.out.println("Service charge of Rs " + serviceCharge + " applied, New balance: Rs " +
balance);
        }
    }
}

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

        System.out.print("Enter customer name: ");
        String name = sc.nextLine();
    }
}

```

```

System.out.print("Enter account number: ");
int accNo = sc.nextInt();
sc.nextLine();
System.out.print("Enter account type (savings/current): ");
String type = sc.nextLine().toLowerCase();
System.out.print("Enter initial balance: ");
double balance = sc.nextDouble();

Account acc;
if (type.equals("savings")) {
    acc = new Savings(name, accNo, balance);
} else {
    acc = new Current(name, accNo, balance);
}

int c;
do {
    System.out.println("\n----- MENU -----");
    System.out.println("1. Deposit");
    System.out.println("2. Withdraw");
    System.out.println("3. Compute Interest");
    System.out.println("4. Display Account Details");
    System.out.println("5. Exit");
    System.out.print("Enter choice: ");
    c = sc.nextInt();
    switch (c) {
        case 1:
            System.out.print("Enter deposit amount: ");
            double deposit = sc.nextDouble();
            acc.deposit(deposit);
            break;
        case 2:
            System.out.print("Enter withdrawal amount: ");
            double withdraw = sc.nextDouble();
            acc.withdraw(withdraw);
            break;
        case 3:
            System.out.print("Enter number of years: ");
            int years = sc.nextInt();
            acc.computeInterest(years);
            break;
        case 4:
            acc.display();
            break;
        case 5:
            System.out.println("Exiting program...");
            break;
    }
}

```

```

        default:
            System.out.println("Invalid choice! Please try again.");
        }
    }
    while (c != 5);
    sc.close();
}
}

```

## Output:

```

PS C:\78> cd "c:\78\" ; if ($?) { javac Bank.java } ; if ($?) { java Bank }
Enter customer name: Hari
Enter account number: 1
Enter account type (savings/current): savings
Enter initial balance: 10000

----- MENU -----
1. Deposit
2. Withdraw
3. Compute Interest
4. Display Account Details
5. Exit
Enter choice: 1
Enter deposit amount: 10000
Updated balance: Rs 20000.0

----- MENU -----
1. Deposit
2. Withdraw
3. Compute Interest
4. Display Account Details
5. Exit
Enter choice: 2
Enter withdrawal amount: 3000
Updated balance: Rs 17000.0

----- MENU -----
1. Deposit
2. Withdraw
3. Compute Interest
4. Display Account Details
5. Exit
Enter choice: 3
Enter number of years: 5
Interest added: Rs 4696.786562500005
Updated balance: Rs 21696.786562500005

----- MENU -----
1. Deposit
2. Withdraw
3. Compute Interest
4. Display Account Details
5. Exit
Enter choice: 4

Account Holder: Hari
Account Number: 1
Account Type: savings
Balance: Rs 21696.786562500005

```

```

----- MENU -----
1. Deposit
2. Withdraw
3. Compute Interest
4. Display Account Details
5. Exit
Enter choice: 5
Exiting program...
PS C:\78>

```

## Program 6

Java Program to show use of Packages

Code:

### Package CIE - Internals.java and Student.java

```
package CIE;
import java.util.Scanner;

public class internals extends student {
    public int internalmarks[] = new int[5];

    public void CIemarks() {
        Scanner sc = new Scanner(System.in);
        for (int i = 0; i < 5; i++) {
            System.out.println("Enter internal marks for subject " + (i+1));
            internalmarks[i] = sc.nextInt();
        }
    }
}

package CIE;
import java.util.Scanner;

public class student {
    public String name;
    public String USN;
    public int sem;
    public void inputdetails() {
        Scanner sc = new Scanner(System.in);
        System.out.println("Enter USN: ");
        USN = sc.nextLine();
        System.out.println("Enter Name: ");
        name = sc.nextLine();
        System.out.println("Enter Semester: ");
        sem = sc.nextInt();
    }
    public void displaydetails() {
        System.out.println("USN: " + USN);
        System.out.println("Name: " + name);
        System.out.println("Semester: " + sem);
    }
}
```

## **Package SEE- externals.java**

```
package SEE;
import CIE.internals;
import java.util.Scanner;

public class externals extends internals {
    public int marks[] = new int[5];
    public int finalmarks[] = new int[5];

    public void SEEmarks() {
        Scanner sc = new Scanner(System.in);
        for (int i = 0; i < 5; i++) {
            System.out.println("Enter SEE marks for subject " + (i+1));
            marks[i] = sc.nextInt();
        }
    }

    public void Totalmarks() {
        for (int i = 0; i < 5; i++) {
            finalmarks[i] = (int)(marks[i] / 2.0) + internalmarks[i];
        }
    }
}
```

## **Main**

```
import SEE.externals;
import java.util.Scanner;

public class MARKS{
    public static void main(String[] args) {

        Scanner sc = new Scanner(System.in);

        System.out.println("Enter number of students: ");
        int n = sc.nextInt();

        externals see[] = new externals[n];

        for (int i = 0; i < n; i++) {
            System.out.println("Enter details for Student " + (i+1));

            see[i] = new externals();

            see[i].inputdetails();
            see[i].CIEmarks();
        }
    }
}
```

```

        see[i].SEEmarks();
        see[i].Totalmarks();
    }
    System.out.println("Final marks of students ");
    for (int i = 0; i < n; i++) {
        System.out.println("Student " + (i+1));
        see[i].displaydetails();

        System.out.println("Final marks:");
        for (int j = 0; j < 5; j++) {
            System.out.println("Subject " + (j+1) + ": " + see[i].finalmarks[j]);
        }
    }
}

```

Output:

```

● PS C:\78> cd "c:\78\" ; if ($?) { javac MARKS.java } ; if (?) { java MARKS }
Enter number of students:
2
Enter details for Student 1
Enter USN:
278
Enter Name:
sha
Enter Semester:
3
Enter internal marks for subject 1
38
Enter internal marks for subject 2
38
Enter internal marks for subject 3
36
Enter internal marks for subject 4
39
Enter internal marks for subject 5
40
Enter SEE marks for subject 1
90
Enter SEE marks for subject 2
90
95
Enter SEE marks for subject 4
95
Enter SEE marks for subject 5
100

```

```
Enter details for Student 2
Enter USN:
380
Enter Name:
sqa
Enter Semester:
3
Enter internal marks for subject 1
39
Enter internal marks for subject 2
39
Enter internal marks for subject 3
39
Enter internal marks for subject 4
40
Enter internal marks for subject 5
40
Enter SEE marks for subject 1
90
Enter SEE marks for subject 2
90
Enter SEE marks for subject 3
90
Enter SEE marks for subject 4
90
Enter SEE marks for subject 5
90
```

#### FINAL MARKS OF STUDENTS

```
Student 1
USN: 278
Name: sha
Semester: 3
Final marks:
Subject 1: 83
Subject 2: 83
Subject 3: 83
Subject 4: 86
Subject 5: 90
Student 2
USN: 380
Name: sqa
Semester: 3
Final marks:
Subject 1: 84
Subject 2: 84
Subject 3: 84
Subject 4: 85
Subject 5: 85
```

## Program 7

### Exception Handling

Code:

```
import java.util.Scanner;

class wrongAgeException extends Exception{
    public wrongAgeException(String msg){
        super(msg);
    }
}

class Father{
    int fage;
    Father(int fage) throws wrongAgeException{
        this.fage=fage;
        if (fage<=0){
            throw new wrongAgeException("Father age can't be negative");
        }
    }
}

class Son extends Father{
    int sage;
    Son(int fage, int sage) throws wrongAgeException{
        super(fage);
        this.sage=sage;
        if(sage<=0){
            throw new wrongAgeException("Son age can't be negative");
        }
        if (sage>=fage){
            throw new wrongAgeException("Son age can't be more than Father age");
        }
    }
}

void display(){
    System.out.println("Father age is: "+fage);
    System.out.println("Son age is: "+sage);
}

public class age {
    public static void main(String[] args) {
```

```

try{
    Scanner s= new Scanner(System.in);
    System.out.println("Enter Father's age: ");
    int fage=s.nextInt();
    System.out.println("Enter Son's age: ");
    int sage=s.nextInt();
    Son fam = new Son(fage, sage);
    fam.display();
    s.close();
}
catch(wrongAgeException e){
    System.out.println("Error: "+e);
}
}

```

Output:

```

PS C:\78> cd "c:\78\" ; if ($?) { javac age.java } ; if ($?) { java age }
Enter Father's age:
45
Enter Son's age:
55
Error: wrongAgeException: Son age can't be more than Father age
PS C:\78> cd "c:\78\" ; if ($?) { javac age.java } ; if ($?) { java age }
Enter Father's age:
45
Enter Son's age:
18
Father age is: 45
Son age is: 18
PS C:\78> cd "c:\78\" ; if ($?) { javac age.java } ; if ($?) { java age }
Enter Father's age:
45
Enter Son's age:
-4
Error: wrongAgeException: Son age can't be negative
PS C:\78> cd "c:\78\" ; if ($?) { javac age.java } ; if ($?) { java age }
Enter Father's age:
-9
Enter Son's age:
-11
Error: wrongAgeException: Father age can't be negative

```

## Program 8

Java Program to show use of Threads

Code:

```
class BMS extends Thread {  
    public void run() {  
        for (int i = 0; i < 5; i++) {  
            System.out.println("BMSCE");  
            try {  
                Thread.sleep(10000);  
            } catch (InterruptedException e) {  
                System.out.println(e);  
            }  
        }  
    }  
  
class CSE extends Thread {  
    public void run() {  
        for (int i = 0; i < 5; i++) {  
            System.out.println("CSE");  
            try {  
                Thread.sleep(2000);  
            } catch (InterruptedException e) {  
                System.out.println(e);  
            }  
        }  
    }  
  
public class Threads{  
    public static void main(String args[]) {  
        BMS t1 = new BMS();  
        CSE t2 = new CSE();  
  
        t1.start();  
        t2.start();  
    }  
}
```

Output:

```
PS C:\78> cd "c:\78\" ; if ($?) { javac Thread
● BMSCE
CSE
CSE
CSE
CSE
CSE
BMSCE
BMSCE
BMSCE
BMSCE
```