B.M.S. COLLEGE OF ENGINEERING
Basavanagudi, Bengaluru- 560019
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

LAB REPORT
On

Object Oriented Java Programming
(23CS3PCOOJ)

Submitted By :
Aditya Dinesh Netrakar
1BM22CS017

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Faculty-In-Charge
Swathi Sridharan

Assistant Professor
Department of Computer Science and Engineering

Program-1

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.

```java
import java.util.Scanner;
import static java.lang.Math.sqrt;
import static java.lang.Math.abs;

public class A{
    public static void main(String[] args) {
        Scanner in = new Scanner(System.in);
        System.out.println("Name: Aditya Dinesh Netrakar");
        System.out.println("Usn: 1BM22CS017");
        System.out.println("Enter a,b,c");
        int a= in.nextInt();
        int b=in.nextInt();
        int c=in.nextInt();
        if(a==0){
            System.out.println("This is not a quadratic equation");
        }
        else{
            int d=b*b-4*a*c;
            if(d>0){
                System.out.println("roots are real");
                float r1 = (float) (-b + sqrt(d))/(2*a) ;
                float r2 = (float) (-b - sqrt(d))/(2*a) ;
                System.out.println(r1);
                System.out.println(r2);
            }
            else if(d<0){
                System.out.println("roots are imaginary");
                float r1 = (float) -b/(2*a);
                float r2 = (float) sqrt(abs(d))/(2*a);
                System.out.println(r1+" " + "+" i"+r2);
```

1

```java
            System.out.println(r1+" - "+" i"+r2);
        }
        else{
            System.out.println("roots are equal");
            float r = (float) -b/(2*a);
            System.out.println(r);
        }
    }
  }
}
```

```
D:\java>java A
Name: Aditya Dinesh Netrakar
Usn: 1BM22CS017
Enter a,b,c
1 6 4
roots are real
-0.76393205
-5.236068

D:\java>javac A.java

D:\java>java A
Name: Aditya Dinesh Netrakar
Usn: 1BM22CS017
Enter a,b,c
1 2 1
roots are equal
-1.0

D:\java>javac A.java

D:\java>java A
Name: Aditya Dinesh Netrakar
Usn: 1BM22CS017
Enter a,b,c
7 1 2
roots are imaginary
-0.071428575 +  i0.5297285
-0.071428575 -  i0.5297285

D:\java>
```

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 SGPA of a student.

```java
import java.util.Scanner;

public class Student {
    String usn;
    String name;
    int i=0;
    private static int[] credit={4, 4, 3, 3, 3, 1, 1, 1};
    Scanner in= new Scanner(System.in);
    public void first(){
        System.out.print("Enter your usn: ");
        usn=in.next();
        System.out.print("Enter your name: ");
        name=in.next();
    }
    public double res(int[] arr){
        double marks=0,sgpa=0;
        int i;
        for(i=0;i<arr.length;i++){
            if(arr[i]>=100){
                arr[i]=arr[i]-10;
            }
            marks+=(credit[i]*((int)arr[i]/10 + 1));
        }
        sgpa=marks/20;

        return sgpa;
    }
    public void display(double result){
        System.out.println("SGPA: "+result);
    }
}

import java.util.Scanner;

public class B {
    public static void main(String[] args) {
        System.out.println("Name: Aditya Dinesh Netrakar");
        System.out.println("USN: 1BM22CS017");
        Scanner in = new Scanner(System.in);
        int arr[]=new int[8];
```

```java
        Student s1= new Student();
        s1.first();
        System.out.println("Enter the total marks:");
        for(int i=0;i<8;i++){
            arr[i]=in.nextInt();
        }
        double result=s1.res(arr);
        s1.display(result);
    }
}
```

```
D:\java>javac B.java

D:\java>java B
Name: Aditya Dinesh Netrakar
USN: 1BM22CS017
Enter your usn: 1BM22CS017
Enter your name: Aditya
Enter the total marks:
90 93 84 87 83 90 96 100
SGPA: 9.55
```

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.

```java
import java.util.Scanner;

class Books{
    String name;
    String author;
    int price;
    int num_pages;
    public void set(int i){
        Scanner in=new Scanner(System.in);
        System.out.println("Enter details of books "+(i+1)+" in name,author,price,num_pages order");
        name=in.next();
        author=in.next();
        price=in.nextInt();
        num_pages=in.nextInt();
    }
    public String toString(int i) {
        return "Details of Book " + (i+1)+"\n"+
            "Name: " + name + "\n" +
            "Author: " + author + "\n" +
            "Price: " + price + "\n" +
            "No of pages: " + num_pages;
    }
}
class D {
    public static void main(String[] args) {
        int n;
        Scanner in=new Scanner(System.in);
        System.out.println("Name: Aditya Dinesh Netrakar");
        System.out.println("USN: 1BM22CS017");
        System.out.println("Enter number of books");
        n=in.nextInt();
        Books b[]=new Books[n];
        for(int i=0;i<n;i++){
            b[i]=new Books();
            b[i].set(i);
        }
        System.out.println();
        for(int i=0;i<n;i++){
            System.out.println(b[i].toString(i));
        }
```

```
        }
}
```

```
Microsoft Windows [Version 10.0.22621.2715]
(c) Microsoft Corporation. All rights reserved.

D:\java\oops>javac D.java

D:\java\oops>java D
Name: Aditya Dinesh Netrakar
USN: 1BM22CS017
Enter number of books
2
Enter details of books 1 in name,author,price,num_pages order
ajhjd spb 299 90
Enter details of books 2 in name,author,price,num_pages order
dbfh eje 300 200

Details of Book 1
Name: ajhjd
Author: spb
Price: 299
No of pages: 90
Details of Book 2
Name: dbfh
Author: eje
Price: 300
No of pages: 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.

```java
import java.util.Scanner;

abstract class Shape{
    int a,b;
    abstract void printArea();
}
class Rectangle extends Shape{
    Rectangle(int l,int br){
        a=l;
        b=br;
    }
    void printArea(){
        int area=a*b;
        System.out.println("Area of rectangle: "+area);
    }
}
class Triangle extends Shape{
    Triangle(int ba,int h){
        a=ba;
        b=h;
    }
    void printArea(){
        double area = 0.5*a*b;
        System.out.println("Area of the triangle: "+area);
    }
}
class Circle extends Shape{
    Circle(int r){
        a=r;
    }
    void printArea(){
        double area=3.14*a*a;
        System.out.println("Area of Circle: "+area);
    }
}
class E {
    public static void main(String[] args) {
        Scanner in=new Scanner(System.in);
        System.out.println("Name: Aditya Dinesh Netrakar");
        System.out.println("USN: 1BM22CS017");
        System.out.println("Enter length and breadth of a rectangle:");
```

```java
        Rectangle rec=new Rectangle(in.nextInt(), in.nextInt());
        rec.printArea();
        System.out.println("Enter base and height of a triangle: ");
        Triangle tri = new Triangle(in.nextInt(), in.nextInt());
        tri.printArea();
        System.out.println("Enter the radius of a circle:");
        Circle cir = new Circle(in.nextInt());
        cir.printArea();
    }
}
```

```
Microsoft Windows [Version 10.0.22621.2715]
(c) Microsoft Corporation. All rights reserved.

D:\java\oops>javac E.java

D:\java\oops>java E
Name: Aditya Dinesh Netrakar
USN: 1BM22CS017
Enter length and breadth of a rectangle:
3 4
Area of rectangle: 12
Enter base and height of a triangle:
4 10
Area of the triangle: 20.0
Enter the radius of a circle:
7
Area of Circle: 153.86
```

Program-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 static java.lang.Math.acos;

import java.util.Scanner;

class Account{
    String cust_name;
    int accno;
    String acc_type;
    double balance;
    public Account(String cust_name,int accno,String acc_type){
        this.cust_name=cust_name;
        this.accno=accno;
        this.acc_type=acc_type;
        this.balance=0;
    }
    public void displayBal(){
        System.out.println("Account number: "+accno);
        System.out.println("Customer name: "+cust_name);
        System.out.println("Account type: "+acc_type);
        System.out.println("Balance: "+balance);
    }
}
class Current extends Account{
    double min_balance,service_charge;
    Current(String cust_name,int accno){
        super(cust_name, accno, "Current");
        this.min_balance=500;
        this.service_charge=20;
    }
    public void withdrawl(double amt){
        if(balance-amt>=min_balance){
            balance-=amt;
            System.out.println("Withdrawl successfull. Current Balance: "+balance);
```

```java
            }
            else{
                System.out.println("Withdrawl not possible due to insufficient funds");
            }
        }
        public void ServiceCharge(){
            if(balance<min_balance){
                balance-=service_charge;
                System.out.println("Service charge imposed. Current balance: "+balance);
            }
        }
    }
}
class Savings extends Account{
    double interest_rate;
    Savings(String cust_name,int accno){
        super(cust_name, accno, "Savings");
        this.interest_rate=0.5;
    }
    public void DepoistInterest(){
        balance+=balance*interest_rate;
        System.out.println("Interest deposited.Current Balance: "+balance);
    }
    public void CompoundInterest(double initial_amt,int time){
        double ci=initial_amt*Math.pow((1+interest_rate),time)-initial_amt;
        balance+=ci;
        System.out.println("Compound interest applied. Current balance: "+balance);
    }
}
public class F {
    public static void main(String[] args) {
        Scanner in = new Scanner(System.in);
        System.out.println("Name: Aditya Dinesh Netrakar");
        System.out.println("USN: 1BM22CS017");
        System.out.println("Choose account type: ");
        System.out.println("1.Savings");
        System.out.println("2.Current");
        System.out.println("Enter choice 1 or 2");
        int choice=in.nextInt();
        System.out.println("Enter customer name: ");
        String cust_name=in.next();
        System.out.println("Enter account number: ");
        int accno=in.nextInt();
        if(choice==1){
            Savings savAcc=new Savings(cust_name, accno);
            System.out.println("Enter initial balance");
            double initial_balance=in.nextDouble();
            savAcc.balance=initial_balance;
            System.out.println("Enter withdrawl amount");
            double withdrawl=in.nextDouble();
            savAcc.balance-=withdrawl;
            System.out.println("Withdrawl successful. Current balance: "+savAcc.balance);
```

```java
        System.out.println("Enter interest rate: ");
        double interest_rate=in.nextDouble();
        savAcc.interest_rate=interest_rate;
        savAcc.displayBal();
        System.out.println("Enter time(in years) to calculate compund interest:");
        int time=in.nextInt();
        savAcc.CompoundInterest(initial_balance, time);
        savAcc.displayBal();
    }
    else if(choice==2){
        Current curAcc = new Current(cust_name, accno);
        System.out.println("Enter initial balance: ");
        double initial_balance=in.nextDouble();
        curAcc.balance=initial_balance;
        System.out.println("Enter withdrawl amount:");
        double amt=in.nextDouble();
        curAcc.withdrawl(amt);
        curAcc.ServiceCharge();
        curAcc.displayBal();
    }
    else{
        System.out.println("Invaid choice");
    }
  }
}
```

```
D:\java\oops>java F
Name: Aditya Dinesh Netrakar
USN: 1BM22CS017
Choose account type:
1.Savings
2.Current
Enter choice 1 or 2
1
Enter customer name:
adi
Enter account number:
001
Enter initial balance
10000
Enter withdrawl amount
1000
Withdrawl successful. Current balance: 9000.0
Enter interest rate:
3
Account number: 1
Customer name: adi
Account type: Savings
Balance: 9000.0
Enter time(in years) to calculate compund interest:
3
Compound interest applied. Current balance: 639000.0
Account number: 1
Customer name: adi
Account type: Savings
Balance: 639000.0
```

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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.

```java
package cie;
public class Internals {
    public int marks[]=new int[5];
}

package cie;
import java.util.*;
public class Student
{
    // instance variables - replace the example below with your own
    public int sem;
    public String usn;
    public String name;

    public void accept()
    {
        Scanner scan = new Scanner(System.in);
        System.out.println("Enter U, N, S:\n");
        usn=scan.nextLine();
        name=scan.nextLine();
        sem=scan.nextInt();
    }
}
package see;
import cie.Student;
public class External extends Student
{
    public int sm[]=new int[5];
}

import java.util.*;
import see.*;
import cie.*;

public class Main {
    public static void main(String[] args) {
        int fm[]=new int[5];
        Scanner sc= new Scanner(System.in);
        System.out.println("Name: Aditya Dinesh Netrakar");
        System.out.println("USN: 1BM22CS017");
        System.out.println("Enter n: ");
```

```java
        int n=sc.nextInt();
        see.External st[]=new see.External[n];
        cie.Internals s[]=new cie.Internals[n];
        for(int i=0; i<n; i++)
        {
            st[i]=new see.External();
            s[i]=new cie.Internals();
            System.out.println("Enter details "+(i+1));
            st[i].accept();
            for(int j=0; j<5; j++)
            {
                System.out.println("Enter im and sm of sub "+(j+1));
                s[i].marks[j]=sc.nextInt();
                st[i].sm[j]=sc.nextInt();
                fm[j]=(s[i].marks[j]+st[i].sm[j])/2;
            }
            System.out.println("Final marks of "+st[i].name);
            for(int k=0; k<5; k++)
            {
                System.out.println("Course "+(k+1)+" = "+fm[k]);
            }
        }
    }
}
```

```
D:\java\oops>javac Main.java

D:\java\oops>java Main
Name: Aditya Dinesh Netrakar
USN: 1BM22CS017
Enter n:
1
Enter details 1
Enter U, N, S:

17
adi
2
Enter im and sm of sub 1
93 95
Enter im and sm of sub 2
96 90
Enter im and sm of sub 3
96 91
Enter im and sm of sub 4
98 97
Enter im and sm of sub 5
90 95
Final marks of adi
Course 1 = 94
Course 2 = 93
Course 3 = 93
Course 4 = 97
Course 5 = 92

D:\java\oops>
```

Program-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<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.

```java
class wrongAge extends Exception{
   public wrongAge(){
      super("Age cannot be negative");
   }
}
class input extends Exception{
   public input(){
      super("Wrong input");
   }
}
class Father{
   public int age;
   Father(int age) throws wrongAge{
      if(age<0){
         throw new wrongAge();
      }
      this.age=age;
   }
}
class Son extends Father{
   int s_age;
   Son(int f_age, int s_age) throws wrongAge,input{
      super(f_age);
      if(s_age<0 && f_age<0){
         throw new wrongAge();
      }
      else if(f_age<=s_age){
         throw new input();
      }
      this.s_age=s_age;
   }
}
public class J {
   public static void main(String[] args) {
      System.out.println("Program 7");
      System.out.println("Name: Aditya Dinesh Netrakar");
      System.out.println("USN: 1BM22CS017");
      try{
         Father f=new Father(40);
         Son s=new Son(40, 56);
```

```
            System.out.println("Son's age: "+s.s_age);
            System.out.println("Father's age: "+f.age);
        }
        catch(wrongAge e){
            System.out.println(e.toString());
        }
        catch(input ae){
            System.out.println(ae.toString());
        }
    }
}
```

```
D:\java\oops>javac J.java

D:\java\oops>java J
Program 7
Name: Aditya Dinesh Netrakar
USN: 1BM22CS017
input: Wrong input

D:\java\oops>
```

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.

```java
class One extends Thread{
   public void run(){
      int i=0;
      while(i<2){
         i++;
         try{
            System.out.println("BMS College of Engineering");
            Thread.sleep(1000);
         }
         catch(Exception e){
            System.out.println(toString());
         }
      }
   }
}
class Two extends Thread{
   public void run(){
      int i=0;
      while(i<2){
         i++;
         try{
            System.out.println("CSE");
            Thread.sleep(200);
         }
         catch(Exception e){
            System.out.println(toString());
         }
      }
   }
}
public class I {
   public static void main(String[] args) {
   System.out.println("Program 8");
   System.out.println("Name: Aditya Dinesh Netrakar");
   System.out.println("USN: 1BM22CS017");
      One t1=new One();
      Two t2=new Two();
      t1.start();
```

```
    t2.start();
  }
}
```

```
D:\java\oops>javac I.java

D:\java\oops>java I
Program 8
Name: Aditya Dinesh Netrakar
USN: 1BM22CS017
BMS College of Engineering
CSE
CSE
BMS College of Engineering

D:\java\oops>
```

Program-9

Write a program that creates a user interface to perform integer divisions. The user enters two numbers in the text fields, Num1 and Num2. The division of Num1 and Num2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, the program would throw a NumberFormatException. If Num2 were Zero, the program would throw an Arithmetic Exception Display the exception in a message dialog box.

```java
import javax.swing.*;
import java.awt.*;
import java.awt.event.*;

class SwingDemo{
    SwingDemo(){
        JFrame jfrm = new JFrame("Divider App");
        jfrm.setSize(275, 150);
        jfrm.setLayout(new FlowLayout());
        jfrm.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);

        JLabel jlab = new JLabel("Enter the divider and divident:");

        // add text field for both numbers
        JTextField ajtf = new JTextField(8);
        JTextField bjtf = new JTextField(8);


        JButton button = new JButton("Calculate");


        JLabel err = new JLabel();
        JLabel alab = new JLabel();
        JLabel blab = new JLabel();
        JLabel anslab = new JLabel();


        jfrm.add(err);
```

```java
jfrm.add(jlab);
jfrm.add(ajtf);
jfrm.add(bjtf);
jfrm.add(button);
jfrm.add(alab);
jfrm.add(blab);
jfrm.add(anslab);

ActionListener l = new ActionListener() {
   public void actionPerformed(ActionEvent evt) {
      System.out.println("Action event from a text field");
   }
};
ajtf.addActionListener(l);
bjtf.addActionListener(l);

button.addActionListener(new ActionListener() {
   public void actionPerformed(ActionEvent evt) {
      try{
         int a = Integer.parseInt(ajtf.getText());
         int b = Integer.parseInt(bjtf.getText());
         int ans = a/b;

         alab.setText("\nA = " + a);
         blab.setText("\nB = " + b);
         anslab.setText("\nAns = "+ ans);
      }
      catch(NumberFormatException e){
         alab.setText("");
         blab.setText("");
         anslab.setText("");
         err.setText("Enter Only Integers!");
      }
      catch(ArithmeticException e){
         alab.setText("");
         blab.setText("");
         anslab.setText("");
         err.setText("B should be NON zero!");
      }
   }
```

```
        });


        jfrm.setVisible(true);
    }

    public static void main(String args[]){
        // create frame on event dispatching thread
        SwingUtilities.invokeLater(new Runnable(){
            public void run(){
                new SwingDemo();
            }
        });
    }
}
```
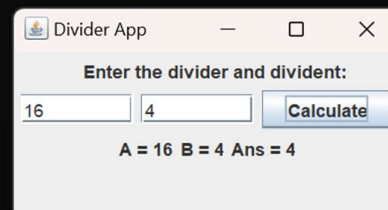
```
Microsoft Windows [Version 10.0.22621.2715]
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D:\java\oops\week 3>javac SwingDemo.java

D:\java\oops\week 3>java SwingDemo
Name: Aditya Dinesh Netrakar
USN: 1BM22CS017
```
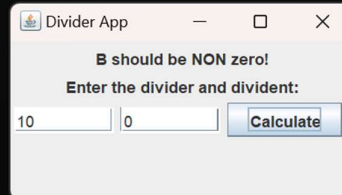
Divider App

Enter the divider and divident:

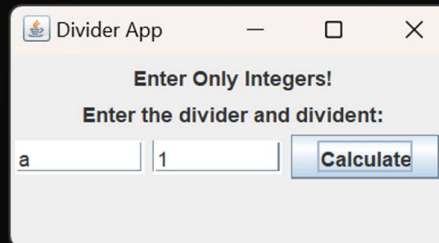| 16 | 4 | Calculate |

A = 16 B = 4 Ans = 4

```
Microsoft Windows [Version 10.0.22621.2715]
(c) Microsoft Corporation. All rights reserved.

D:\java\oops\week 3>java SwingDemo
Name: Aditya Dinesh Netrakar
USN: 1BM22CS017
```

Divider App — □ ✕

B should be NON zero!

Enter the divider and divident:

| 10 | 0 | **Calculate** |

```
D:\java\oops\week 3>java SwingDemo
Name: Aditya Dinesh Netrakar
USN: 1BM22CS017
```

Divider App — □ ✕

Enter Only Integers!

Enter the divider and divident:

| a | 1 | **Calculate** |

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