B.M.S. COLLEGE OF ENGINEERING
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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

LAB REPORT
On

Object Oriented Java Programming
(23CS3PCOOJ)
Submitted By:

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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

```
C:\Users\Arya\Desktop\java>javac Squad.java

C:\Users\Arya\Desktop\java>java Squad
enter 3 intergers:

3
4
2
Roots are imaginary, there are no real solutions
-0.6666667+i0.47140452
-0.6666667-i0.47140452

C:\Users\Arya\Desktop\java>
```

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

public class Squad {
    public static void main(String[] args) {
        System.out.println("enter 3 intergers:\n");
        Scanner sc = new Scanner(System.in);
        int a = sc.nextInt();
        int b = sc.nextInt();
        int c = sc.nextInt();

        if(a == 0) {
            System.out.println("Invalid input");
        } 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, there are no real solutions");
                float realPart = (float)-b / (2 * a);
                float imaginaryPart = (float)sqrt(abs(d)) / (2 * a);
                System.out.println(realPart + "+i" + imaginaryPart);
                System.out.println(realPart + "-i" + imaginaryPart);

            } else {
                System.out.println("Roots are equal");
                float r = (float)-b / (2 * a);
                System.out.println(r);
            }
        }
    }
}
```

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.

```
C:\Users\Arya\Desktop\java>javac Main.java

C:\Users\Arya\Desktop\java>java Main
Enter your namearu
Enter your USN:
1bm22cs055
Enter marks for subject1:78
enter your credits for subject 1:4
Enter marks for subject2:90
enter your credits for subject 2:3
Enter marks for subject3:90
enter your credits for subject 3:4
Enter marks for subject4:89
enter your credits for subject 4:2
Enter marks for subject5:85
enter your credits for subject 5:1
Enter marks for subject6:75
enter your credits for subject 6:3
Enter marks for subject7:56
enter your credits for subject 7:4
Enter marks for subject8:67
enter your credits for subject 8:4
Enter marks for subject9:50
enter your credits for subject 9:1
Name:aru
USN:1bm22cs055
SGPA:8.115384615384615
```

```java
import java.util.Scanner;
class Subject
{
int subjectMarks;
int credits;
int grade;
}
class Student
{
//Subject subject[];
String name;
String USN;
double SGPA;
//Scanner s;
Student()
{
```

```java
int i;
Subject subject[]=new Subject[9];
for(i=0;i<9;i++)
{
subject[i]=new Subject();
Scanner s=new Scanner(System.in);
}}
void getStudentDetails()
{
System.out.print("Enter your name");
name=s.next();
System.out.println("Enter your USN:");
USN=s.next();
}
void getMarks(){
for(int i=0;i<=8;i++)
{
System.out.print("Enter marks for subject"+(i+1)+":");
subject[i].subjectMarks=s.nextInt();
System.out.print("enter your credits for subject "+(i+1)+":");
subject[i].credits=s.nextInt();
subject[i].grade=(subject[i].subjectMarks/10)+1;
if(subject[i].grade==11)
subject[i].grade=10;
if(subject[i].grade<=4)
subject[i].grade=0;
}
}
void computeSGPA()
{
int effectiveScore=0;
int totalCredits=0;
for(int i=0;i<9;i++)
{
effectiveScore+=(subject[i].grade*subject[i].credits);
totalCredits+=subject[i].credits;
}
SGPA=(double)effectiveScore/(double)totalCredits;
}
}
class Main
{
public static void main(String args[])
{
```

```java
Student s1= new Student();
s1.getStudentDetails();
s1.getMarks();
s1.computeSGPA();
System.out.println("Name:"+s1.name);
System.out.println("USN:"+s1.USN);
System.out.println("SGPA:"+s1.SGPA);
}
}
```

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.


```
C:\Users\Arya\Desktop\java>javac Book.java

C:\Users\Arya\Desktop\java>java Book
Enter number of books
1
Enter bookname, author, price, num_pages
valley
yo
230
200
Book details
The book valley was written by yo. It consists of 200 pages and costs around $230.0

C:\Users\Arya\Desktop\java>
```

```java
import java.util.Scanner;

class Book {
    String name;
    String author;
    float price;
    int num_pages;

    void set_details() {
        Scanner sc = new Scanner(System.in); // Added System.in to Scanner constructor
        System.out.println("Enter bookname, author, price, num_pages");
        name = sc.next();
        author = sc.next();
        price = sc.nextFloat();
        num_pages = sc.nextInt();
    }

    void get_details() {
        String details = toString();
        System.out.println(details);
    }
```

```java
    public String toString() {
        return "The book " + name + " was written by " + author + ". It consists of " + num_pages +
" pages and costs around $" + price;
    }

    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in); // Added System.in to Scanner constructor
        System.out.println("Enter number of books");
        int n = sc.nextInt();
        Book b[ ] = new Book[n];
        for (int i = 0; i < n; i++) {
            b[i] = new Book();
            b[i].set_details();
        }
        System.out.println("Book details");
        for (int i = 0; i < n; i++) {
            b[i].get_details();
        }
    }

import java.util.Scanner;

class Book {
    String name;
    String author;
    float price;
    int num_pages;

    Book(String name,String author,float price,int num_pages)
    {
        this.name=name;
        this.author=author;
        this.price=price;
        this.num_pages=num_pages;
    }
    // Book()
    // {
    //     System.out.println("hi");
    // }

    void set_details() {
        Scanner sc = new Scanner(System.in); // Added System.in to Scanner constructor
        System.out.println("Enter bookname, author, price, num_pages");
        name = sc.next();
```

```java
        author = sc.next();
        price = sc.nextFloat();
        num_pages = sc.nextInt();
    }

    void get_details() {
        String details = toString();
        System.out.println(details);
    }

    public String toString() {
        return "The book " + name + " was written by " + author + ". It consists of " + num_pages +
" pages and costs around $" + price;
    }

    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in); // Added System.in to Scanner constructor
        System.out.println("Enter number of books");
        int n = sc.nextInt();
        Book b[ ] = new Book[n];

        b[0] = new Book("ABC","DEF",255,455);
        b[1] = new Book("ABdC","DErF",2553,455);
        //b[2].set_details();
        b[0].get_details();
        b[1].get_details();

        //  for (int i = 0; i < n; i++){
        //     b[i] = new Book();
        //  b[i].set_details();
        // }

           // b[i].set_details();

        System.out.println("Book details");
        //for (int i = 0; i < n; i++) {
        //     b[i].get_details();
        // }
    }
}
```

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.

```
C:\Users\Arya\Desktop\java>javac Shape.java

C:\Users\Arya\Desktop\java>java Shape
enter the radius of the circle
2
area of the circle is12.56
enter the length and breadth of Rectangle
2
3
area of the rectangle is6
enter the base and height of Triangle
4
6
area of the triangle is12.0
```

```java
import java.util.Scanner;
abstract class Shape
{
int x,y;
abstract void PrintArea();
public static void main(String args[])
{
        Shape obj1 = new Circle();
        obj1.PrintArea();
        Shape obj2 = new Rectangle();
        obj2.PrintArea();
        Shape obj3= new Triangle();
        obj3.PrintArea();
}
}
class Circle extends Shape{
        Circle()
        {
                Scanner sc = new Scanner(System.in);
                System.out.println("enter the radius of the circle");
                x=sc.nextInt();
                y=x;
        }
        void PrintArea()
        {
                System.out.println("area of the circle is"+ 3.14*x*y);
```

```
        }
}
class Rectangle extends Shape{
        Rectangle()
        {
                Scanner sc = new Scanner(System.in);
                System.out.println("enter the length and breadth of Rectangle");
                x=sc.nextInt();
                y=sc.nextInt();
        }
        void PrintArea()
        {
                System.out.println("area of the rectangle is"+ x*y);
        }
}
class Triangle extends Shape{
        Triangle()
        {
                Scanner sc = new Scanner(System.in);
                System.out.println("enter the base and height of Triangle");
                x=sc.nextInt();
                y=sc.nextInt();
        }
        void PrintArea()
        {
                System.out.println("area of the triangle is"+ 0.5*x*y);
        }
}
```
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.

```
C:\Users\Arya\Desktop\java>java Bank
Choose account type:
1. Current
2. Savings
Enter choice (1 or 2): 2
Enter customer name: aru
Enter account number: 2
Enter initial balance: $245
Enter withdrawal amount: $235
Withdrawal successful. Current Balance: $10.0
Enter interest rate: 3
Account Number: 2
Customer Name: aru
Account Type: Savings
Balance: $10.0
Enter term (in years) for compound interest calculation: 20
Compound Interest deposited. Current Balance: Rs.2.69380348804885E14
Account Number: 2
Customer Name: aru
Account Type: Savings
Balance: $2.69380348804885E14
```

import java.util.Scanner;

class Account
{

String customerName;

long accno;

String accountType;

double balance;

public Account (String customerName, long accno, String accountType)
 {

this.customerName = customerName;

this.accno = accno;

this.accountType = accountType;

this.balance = 0.0;

}
public void displayBalance ()

```java
    {
System.out.println ("Account Number: " + accno);

System.out.println ("Customer Name: " + customerName);

System.out.println ("Account Type: " + accountType);

System.out.println ("Balance: $" + balance);

}
}
class CurAcct extends Account

{

double minBalance;

double serviceCharge;

public CurAcct (String customerName, long accno)
  {

super (customerName, accno, "Current");

this.minBalance = 500.0;      // Set minimum balance
        this.serviceCharge = 50.0;     // Set service charge
  }
public void withdraw (double amount)
  {

if (balance - amount >= minBalance)
          {

balance -= amount;

System.out.println ("Withdrawal successful. Current Balance: $" +
                                            balance);

}
        else
          {

System.out.println ("Insufficient funds. Withdrawal not allowed.");
```

```java
    }

    }

    public void imposeServiceCharge ()
     {

    if (balance < minBalance)
            {

    balance -= serviceCharge;

    System.out.println ("Service charge imposed. Current Balance: Rs." +
                                            balance);

    }

    }

    }


    class SavAcct extends Account
    {

    double interestRate;


    public SavAcct (String customerName, long accno)
     {

    super (customerName, accno, "Savings");

    this.interestRate = 0.05;

    }

    public void depositInterest ()
     {

    double interest = balance * interestRate;

    balance += interest;
```

```java
        System.out.println ("Interest deposited. Current Balance: $" + balance);

    }

    public void compoundInterest (double initialAmount, int term)
     {

        double compoundInterest =
                initialAmount * Math.pow ((1 + interestRate), term) - initialAmount;

        balance += compoundInterest;

        System.out.println ("Compound Interest deposited. Current Balance: Rs." +
                                            balance);

    }
}
public class Bank

{

    public static void main (String[]args)
     {

        Scanner scanner = new Scanner (System.in);

        System.out.println ("Choose account type:");

        System.out.println ("1. Current");

        System.out.println ("2. Savings");

        System.out.print ("Enter choice (1 or 2): ");

        int choice = scanner.nextInt ();

        System.out.print ("Enter customer name: ");

        String customerName = scanner.next ();

        System.out.print ("Enter account number: ");

        long accno = scanner.nextLong ();
```

```java
if (choice == 1)
        {

CurAcct curAccount = new CurAcct (customerName, accno);

System.out.print ("Enter initial balance: $");

double initialBalance = scanner.nextDouble ();

curAccount.balance = initialBalance;

System.out.print ("Enter withdrawal amount: $");

double withdrawalAmount = scanner.nextDouble ();

curAccount.withdraw (withdrawalAmount);

curAccount.imposeServiceCharge ();

curAccount.displayBalance ();

}
        else if (choice == 2)
          {

SavAcct savAccount = new SavAcct (customerName, accno);

System.out.print ("Enter initial balance: $");

double initialBalance = scanner.nextDouble ();

savAccount.balance = initialBalance;

System.out.print ("Enter withdrawal amount: $");

double withdrawalAmount = scanner.nextDouble ();

savAccount.balance -= withdrawalAmount;

System.out.println ("Withdrawal successful. Current Balance: $" +
                                          savAccount.balance);

System.out.print ("Enter interest rate: ");
```

```java
double interestRate = scanner.nextDouble ();

savAccount.interestRate = interestRate;

savAccount.displayBalance ();

System.out.
                print ("Enter term (in years) for compound interest calculation: ");

int term = scanner.nextInt ();

savAccount.compoundInterest (initialBalance, term);

savAccount.displayBalance ();

}
      else
       {

System.out.println ("Invalid choice");

    }

  }

}
```

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.

```
Microsoft Windows [Version 10.0.22621.3155]
(c) Microsoft Corporation. All rights reserved.

C:\Users\Arya\Desktop\pack>javac -d . Student.java

C:\Users\Arya\Desktop\pack>javac -d . Internals.java

C:\Users\Arya\Desktop\pack>javac -d . Externals.java

C:\Users\Arya\Desktop\pack>javac Main.java

C:\Users\Arya\Desktop\pack>java Main
Enter the value of n
1
Enter name:
arya
Enter usn:
1bm22cs055
Enter semester:
3
Enter internal marks of course 1:
23
Enter internal marks of course 2:
35
Enter internal marks of course 3:
37
Enter internal marks of course 4:
38
Enter internal marks of course 5:
32
```

```
Enter semester:
3
Enter internal marks of course 1:
23
Enter internal marks of course 2:
35
Enter internal marks of course 3:
37
Enter internal marks of course 4:
38
Enter internal marks of course 5:
32
Enter external marks of course 1:
30
Enter external marks of course 2:
56
Enter external marks of course 3:
89
Enter external marks of course 4:
90
Enter external marks of course 5:
95
Name: arya
USN: 1bm22cs055
Sem 3
Course 1:38.0
Course 2:63.0
Course 3:82.0
Course 4:83.0
Course 5:80.0
```

```java
//cie PACKAGE
// Student.java
package cie;

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

    public void setStudent(String nam, String sn, int semester) {
        name = nam;
        usn = sn;
        sem = semester;
    }
}
//Internals.java
package cie;
import java.util.Scanner;
public class Internals extends Student{
    public Scanner reader = new Scanner(System.in);
    public int[] inmarks = new int[5];
    public void setInternals(){
        for(int i=0; i<5; i++){
            System.out.println("Enter internal marks of course " + (i+1) + ":");
            inmarks[i] = reader.nextInt();
        }
    }
}
//see PACKAGE
//Externals.java
package see;
import java.util.Scanner;
import cie.*;
public class Externals extends Student{
    public Scanner reader = new Scanner(System.in);
    public int[] exmarks = new int[5];
    public void setExternals(){
        for(int i=0; i<5; i++){
            System.out.println("Enter external marks of course " + (i+1) + ":");
            exmarks[i] = reader.nextInt();
        }
    }
}
```

```java
import cie.*;
import see.*;
import java.util.Scanner;
import java.lang.Math;

public class Main {
    public static void main(String[] args) {
        int i, j;
        Scanner reader = new Scanner(System.in);
        System.out.println("Enter the value of n");
        int n = reader.nextInt();
        cie.Internals[] intarr = new cie.Internals[n];
        see.Externals[] extarr = new see.Externals[n];
        String name, usn;
        int semester;

        for (i = 0; i < n; i++) {
            System.out.println("Enter name: ");
            name = reader.nextLine();
            name = reader.nextLine();
            System.out.println("Enter usn: ");
            usn = reader.nextLine();
            // usn = reader.nextLine();
            System.out.println("Enter semester: ");
            semester = reader.nextInt();
            cie.Internals studin = new cie.Internals();
            studin.setInternals();
            see.Externals studex = new see.Externals();
            studex.setExternals();
            studin.setStudent(name, usn, semester);
            studex.setStudent(name, usn, semester);
            intarr[i] = studin;
            extarr[i] = studex;
        }

        for (i = 0; i < n; i++) {
            System.out.println("Name: " + intarr[i].name);
            System.out.println("USN: " + intarr[i].usn);
            System.out.println("Sem " + intarr[i].sem);

            for (j = 0; j < 5; j++) {
                System.out.println("Course " + (j + 1) + ":"
                        + (intarr[i].inmarks[j] + Math.ceil((double) extarr[i].exmarks[j] / 2)));
            }
```

```java
        System.out.println("");
    }

    System.out.println("1BM22CS055 Arya Himanshu");
  }
}
```

Program 8:


```java
class A extends Thread
{
    int t1,time;
    A()
    {

        t1=10000;
        time=21000;
    }
```

```java
    public void run()
    {
       while(t1<=time)
       {
          System.out.println("BMS College of Engineering");

          try{
             sleep(10000);
          }
          catch(Exception e)
          {
             System.out.println("error");
          }

          t1+=10000;

       }

    }
}
class B extends Thread
{
    int time,t2;
    B()
    {

       time=21000;
       t2=2000;

    }
    public void run()
    {
    while(t2<=time)
    {
       System.out.println("CSE");

       try{
          sleep(2000);
       }
       catch(Exception e)
       {
          System.out.println("error");

       }
```

```
            t2+=2000;

        }
        }

}

class Main
{
    public static void main(String args[])
    {
        A a= new A();
        B b= new B();
        a.start();
        b.start();
    }
}
```

Program 7:

```
import java.util.Scanner;

class WrongAge extends Exception{

    public WrongAge(String message)

{

    super(message);

}
```

```java
}

class Father{

    int fatherAge;

    public Father(int fatherAge) throws WrongAge

    {


        if(fatherAge < 0)

        {

            throw new WrongAge("Age cannot be negative");

        }

        this.fatherAge=fatherAge;

    }

}

    class Son extends Father{

        int sonAge;

        public Son(int fatherAge,int sonAge) throws WrongAge{

            super(fatherAge);

            if(sonAge >= fatherAge)
```

```java
        {

            throw new WrongAge("son's age muxt be less than father's age");

        }



    this.sonAge=sonAge;

    }

}



public class fatherson

{

    public static void main(String []args)

    {

        Scanner sc= new Scanner(System.in);

        System.out.println("Enter fathers age and sons age:");

        int fa= sc.nextInt();

        int so=sc.nextInt();
```

```
    try{

        Son s=new Son(fa,so);

        System.out.println("Fathers age"+s.fatherAge);

        System.out.println("Son's age:"+s.sonAge);

    }

    catch(WrongAge e){

        System.out.println("Error"+e.getMessage());

    }

  }

}
```

```
C:\Users\Arya\Desktop\java>javac fatherson.java

C:\Users\Arya\Desktop\java>java fatherson
Enter fathers age and sons age:
23
56
Errorson's age muxt be less than father's age

C:\Users\Arya\Desktop\java>
```

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.
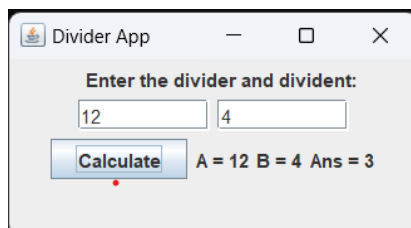

```java
import javax.swing.*;

import java.awt.*;

import java.awt.event.*;


class SwingDemo{

    SwingDemo(){

        // create jframe container

        JFrame jfrm = new JFrame("Divider App");

        jfrm.setSize(275, 150);

        jfrm.setLayout(new FlowLayout());
```

// to terminate on close

jfrm.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);

// text label

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);

// calc button

JButton button = new JButton("Calculate");

// labels

JLabel err = new JLabel();

JLabel alab = new JLabel();

JLabel blab = new JLabel();

```java
JLabel anslab = new JLabel();


// add in order :)

jfrm.add(err);  // to display error bois

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);
```

```java
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("");
```

```java
                err.setText("Enter Only Integers!");

        }

        catch(ArithmeticException e){

            alab.setText("");

            blab.setText("");

            anslab.setText("");

            err.setText("B should be NON zero!");

        }

    }

});



    // display frame

    jfrm.setVisible(true);

}



public static void main(String args[]){

    // create frame on event dispatching thread

    SwingUtilities.invokeLater(new Runnable(){
```

```java
        public void run(){

            new SwingDemo();

        }

    });

  }

}
```