

## Program 1

Develop a Java program that prints all real solutions to the quadratic equation  $ax^2 + bx + c = 0$ .

Read in a, b, c and use the quadratic formula. If the discriminant  $b^2 - 4ac$  is negative, display a message stating that there are no real solutions.

```
import
java.util.*;

import java.lang.Math.*;
class Main
{
    public static void main (String args[])
    {
        Scanner s = new Scanner(System.in);
        int a,b,c;
        double r1,r2, im1, im2;
        System.out.println(" Enter the coefficients");
        a= s.nextInt();
        b =s.nextInt();
        c=s.nextInt();
        int d= (b*b - (4*a*c));
        System.out.println(" Discriminant=" +d);
        if(d>0)
        {
            System.out.println(" Roots are real and distinct\n");
            r1= (-b + Math.sqrt (d))/ (2*a);
            r2=(-b - Math.sqrt (d))/ (2*a);
            System.out.println(" The roots are:" +r1+ "and" +r2);

        }
        else if(d==0)
        {
            System.out.println(" Roots are real and equal\n");
            r1=r2= -b/ (2*a);
            System.out.println(" The roots are:" +r1+ "and"+r2);

        }
        else
        {
            System.out.println(" There is no real solution ");

        }
    }
}
```

```
Enter the coefficients
1 2
3
Disriminant=-8
There is no real solution
```

## 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.

```
import
java.util.*;

class Main
{
    public String usn;
    public String name;
    public int credits[]=new int[5];
    public int marks[]=new int[5];
    public int sum;
    public float sgpa;

    public void accept()
    {
        int i;
        Scanner s= new Scanner(System.in);
        System.out.println("Enter name:");
        name= s.next();
        System.out.println("Enter usn:");
        usn= s.next();
        System.out.println("Enter marks for 5 subjects");
        for(i=0; i<5; i++)
        {
            marks[i]=s.nextInt();
        }
        System.out.println("Enter the credits:");
        for(i=0; i<5; i++)
        {
            credits[i]=s.nextInt();
            sum= sum+credits[i];
        }
    }

    public void display()
```

```

{
int i;
System.out.println("Name:"+name);
System.out.println("USN:"+usn);
System.out.println("Marks:");
for(i=0; i<5;i++)
{
System.out.println(marks[i]);
}
System.out.println("Credits:");
for(i=0;i<5;i++)
{
System.out.println(credits[i]);
sum=sum+credits[i];
}
System.out.println("SGPA:" +sgpa);
}

```

```

public void calculate()
{
int i, gradepoints, total;
total=0;
for(i=0; i<5; i++)
{
gradepoints=0;
if(marks[i]>=90)
{
gradepoints=10*credits[i];
total=total+gradepoints;
}
else if(marks[i]>=75)
{
gradepoints=9*credits[i];
total=total+gradepoints;
}
else if(marks[i]>=60)
{
gradepoints=8*credits[i];
total=total+gradepoints;
}
else if(marks[i]>=50)
{
gradepoints=7*credits[i];
total=total+gradepoints;
}
else if(marks[i]>=45 )

```

```

    {
        gradepoints=6*credits[i];
        total=total+gradepoints;
    }
    else if(marks[i]>=40)
    {
        gradepoints=5*credits[i];
        total=total+gradepoints;
    }
    else
    {
        total=total+0;
    }
}
sgpa=(float)total/sum;
}

public static void main (String args[])
{
    Main obj=new Main();
    obj.accept();
    obj.calculate();
    obj.display();
}
}

```

```

Enter name:
AG
Enter usn:
1bm18cs018
Enter marks for 5 subjects
60
80
70
50
90
Enter the credits:
4 5
3 2 2
Name:AG
USN:1bm18cs018
Marks:
60
80
70
50
90
Credits:
4
5
3
2
2
SGPA:8.4375

```

### Program 3

Create a class Book which contains four members: name, author, price, num\_pages. Include a constructor to set the values for the members. Include methods to set and get the details of the objects. Include a toString( ) method that could display the complete details of the book. Develop a Java program to create n book objects.

```
import
java.util.*;

class book
{
    public String name;
    public String author;
    public float price;
    public int pages;

    public void set_data()
    {
        Scanner s=new Scanner(System.in);
        System.out.println("Enter name of the book: ");
        name=s.next();
        System.out.println("Enter author of the book: ");
        author=s.next();
        System.out.println("Enter price of the book: ");
        price=s.nextFloat();
        System.out.println("Enter number of pages in the book: ");
        pages=s.nextInt();
    }
    public void get_data()
    {
        System.out.println("\nName: "+name+"\nAuthor: "+author+"\nPrice:
"+price+"\nPages: "+pages+"\n");
    }
    public String toString()
    {
        return("\nName: "+name+"\nAuthor: "+author+"\nPrice:
"+price+"\nPages: "+pages+"\n");
    }
}

class Main
{
    public static void main(String args[])
    {
        int i=0;
        int ch;
        Scanner a=new Scanner(System.in);
```

```

System.out.print("Enter number of objects: ");
int n=a.nextInt();
book b[]=new book[10];
while(i<n)
{
    b[i]=new book();
    System.out.println("Book "+(i+1));
    System.out.println("\n1)Using set and get data\n2)Using toString
method\n3)Exit\n");
    System.out.print("Enter your choice: ");
    ch=a.nextInt();
    switch(ch)
    {
        case 1:b[i].set_data();
                b[i].get_data();
                break;
        case 2:b[i].set_data();
                System.out.println(b[i]);
                break;
        case 3:System.exit(0);
                break;
    }
    i++;
}
}

```

```

Enter number of objects: 2
Book 1

1)Using set and get data
2)Using toString method
3)Exit

Enter your choice: 2
Enter name of the book:
bca
Enter author of the book:
NB
Enter price of the book:
200
Enter number of pages in the book:
500

Name: bca
Author: NB
Price: 200.0
Pages: 500

```

```

Book 2

1)Using set and get data
2)Using toString method
3)Exit

Enter your choice: 1
Enter name of the book:
abc
Enter author of the book:
LM
Enter author of the book:
LM
Enter price of the book:
100
Enter number of pages in the book:
200

Name: abc
Author: LM
Price: 100.0
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.

```

import
java.util.*
;

import java.lang.Math.*;
abstract class Shape{
    public int dim1, dim2;
    abstract public void printArea();

    Scanner s = new Scanner(System.in);

```

```

    }
    class Rectangle extends Shape{
        public void printArea(){
            System.out.println("Length and Breadth:");
            dim1 = s.nextInt();
            dim2 = s.nextInt();
            System.out.println("Area = "+(float)(dim1*dim2));
        }
    }
    class Circle extends Shape{
        public void printArea(){
            System.out.println("Radius:");
            dim1 = s.nextInt();
            System.out.println("Area = "+(float)((Math.PI)*dim1*dim1));
        }
    }
    class Triangle extends Shape{
        public void printArea(){
            System.out.println("Height and Breadth:");
            dim1 = s.nextInt();
            dim2 = s.nextInt();
            System.out.println("Area = "+(float)(0.5*dim1*dim2));
        }
    }
    class Main{
        public static void main(String args[]){
            Scanner s = new Scanner(System.in);

            System.out.println("Shape:\n1.Rectangle\n2.Circle\n3.Triangle\nChoice:");

            int choice = s.nextInt();
            switch(choice){
                case 1:
                    Shape rec = new Rectangle();
                    rec.printArea();
                    break;
                case 2:
                    Shape cir = new Circle();
                    cir.printArea();
                    break;
                case 3:
                    Shape tri = new Triangle();
                    tri.printArea();
                    break;
                default:
                    System.out.println("Wrong Input.\n");
            }
        }
    }
}

```



```

    }
}
}

```

```

Shape:
1.Rectangle
2.Circle
3.Triangle
Choice:
1
Length and Breadth:
5 4
Area = 20.0

```

## Program 5

### Bank Program

```

import
java.util.*;

import java.lang.Math.*;

class bank{
    public int cust_id, acc_no;
    public double balance, CI;
    public String acc_type, cust_name;

    Scanner s = new Scanner(System.in);

    void input(){
        System.out.print("\nEnter Details:\n");
        System.out.print("\tCustomer ID:");
        cust_id = s.nextInt();
        System.out.print("\tCustomer Name:");
        cust_name = s.next();
        System.out.print("\tAccount number:");
        acc_no = s.nextInt();
        System.out.print("\tBalance:");
        balance = s.nextDouble();
    }

    void cal_interest(){
        System.out.print("\n---INTEREST---:\n");
        System.out.print("\tRate:");
        double rate = s.nextDouble();
        System.out.print("\tTerm(in years):");
    }
}

```

```

        double time = s.nextDouble();
        double tot = balance * Math.pow((1 + (rate/100)), time);
        CI = tot - balance;
        System.out.println("Compund Interest = "+CI);
    }

    void display(){
        System.out.println("\n---DETAILS---");
        System.out.println("\tCustomer Name:
"+cust_name+"\n\tID:"+cust_id);
        System.out.println("\tAccount Number:"+acc_no);
        System.out.println("\tCompund Interest:"+CI);
    }

    void withdrawal(){
        System.out.print("\n---WITHDRAWAL---\n");
        System.out.print("\tEnter amount to withdraw:");
        double wd = s.nextDouble();
        balance -= wd;
    }
}

class savings extends bank{
    // no cheque facility.
    void display(){
        super.display();
        System.out.println("\tNo Cheque Facility Available.");
    }
}

class current extends bank{
    // check min balance and assign service charge
    double min_balance = 5000.00;
    double svc_chrg = 0.05 * balance; // svc charge is 5% of balance
    void cal_interest(){
        if(balance <= min_balance){
            System.out.print("Balance is less than Minimum!\n");
            System.out.print("Service charge "+svc_chrg+" has been
debited!\n");
            balance -= svc_chrg;
            System.out.print("Balance = "+balance);
        }
    }
}

```

```

        super.cal_interest();
    }

    // provides cheque book facility
    void display(){
        super.display();
        System.out.println("\tCheque Facility Available.");
    }
}

class Main{
    public static void main(String args[]){
        Scanner s = new Scanner(System.in);
        int ch = 0;

        while(ch!=4){
            System.out.print("\n---BANK-MENU---\n");
            System.out.print("1.Savings\n2.Current\n4.Exit\n  Choice:");
            ch = s.nextInt();
            switch(ch){
                case 1:
                    bank b1 = new savings();
                    b1.input();
                    b1.withdrawal();
                    b1.cal_interest();
                    b1.display();
                    break;

                case 2:
                    bank b2 = new current();
                    b2.input();
                    b2.withdrawal();
                    b2.cal_interest();
                    b2.display();
                    break;

                case 4:
                    break;

                default:
                    System.out.println("Wrong Input!");
            }
        }
    }
}

```

}

```
----BANK-MENU----
1.Savings
2.Current
4.Exit
Choice:1

Enter Details:
    Customer ID:123
    Customer Name:abd
    Account number:09876
    Balance:5000

---WITHDRAWAL---
    Enter amount to withdraw:200

---INTEREST---:
    Rate:4
    Term(in years):2
Compound Interest = 391.6800000000003

---DETAILS---
    Customer Name: abd
    ID:123
    Account Number:9876
    Compound Interest:391.6800000000003
    No Cheque Facility Available.

----BANK-MENU----
1.Savings
2.Current
4.Exit
Choice:
```

## Program 6

### Packages

```
package CIE;
```

```
import java.util.*;
```

```
public class Student
```

```
{
```

```
    public String usn,name;
```

```
    public int sem;
```

```
    public void input()
```

```
    {
```

```
        Scanner sc=new Scanner(System.in);
```

```
        System.out.println("---enter student details---");
```

```
        System.out.print("name : ");
```

```
        name= sc.nextLine();
```

```
        System.out.print("usn : ");
```

```
        usn=sc.nextLine();
```

```
        System.out.print("sem : ");
```

```

        sem=sc.nextInt();

        System.out.println();

    }

    public void display()
    {

        System.out.println("---student details---");

        System.out.println("name : "+name);

        System.out.println("usn : "+usn);

        System.out.println("sem : "+sem);

    }

}

```

```

package CIE;

import java.util.*;

public class Internals
{

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

    public void input()
    {

        Scanner sc=new Scanner(System.in);

        System.out.println("enter cie marks in 5 courses :");

        for(int i=0;i<5;i++)

            cie_marks[i]=sc.nextInt();

    }

    public void display()
    {

        System.out.println("cie marks : ");
    }

}

```

```

        for(int i=0;i<5;i++)
            System.out.print(cie_marks[i]+" ");
        System.out.println();
    }

}

```

```

package SEE;
import CIE.*;
import java.util.*;
public class External extends CIE.Student
{
    public int see_marks[]=new int[5];
    public void input()
    {
        Scanner sc=new Scanner(System.in);
        System.out.println("enter see marks in 5 courses :");
        for(int i=0;i<5;i++)
            see_marks[i]=sc.nextInt();
    }
    public void display()
    {
        System.out.println("see marks : ");
        for(int i=0;i<5;i++)
            System.out.print(see_marks[i]+" ");
        System.out.println();
    }
}

```

```

import CIE.*;

import SEE.*;

import java.util.*;

class main
{
    int final_marks[]=new int[5];

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

        System.out.println("enter no of students ");

        int n=sc.nextInt();

        CIE.Student []o1=new CIE.Student[n];

        CIE.Internals []o2=new CIE.Internals[n];

        SEE.External []o3=new SEE.External[n];

        main []obj=new main[n];

        for(int i=0;i<n;i++)
        {
            o1[i]=new CIE.Student();

            o2[i]=new CIE.Internals();

            o3[i]=new SEE.External();

            obj[i]=new main();

            o1[i].input();

            o2[i].input();

            o3[i].input();

            for(int j=0;j<5;j++)

                obj[i].final_marks[j]=o2[i].cie_marks[j]+(o3[i].see_marks[j]/2);

        }

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

```

```

        {

            o1[i].display();

            o2[i].display();

            o3[i].display();

            System.out.println("final marks in 5 courses");

            for(int j=0;j<5;j++)

                System.out.print(obj[i].final_marks[j]+" ");

            System.out.println();

        }

    }

}

```

```

C:\Users\Prashanth\Documents\java programs\lab6>java main
enter no of students
2
---enter student details---
name : neha
usn : 123
sem : 3

enter cie marks in 5 courses :
45 40 45 40 50
enter see marks in 5 courses :
90 95 90 95 100
---enter student details---
name : nikhil
usn : 456
sem : 3

enter cie marks in 5 courses :
40 40 50 40 40
enter see marks in 5 courses :
80 80 100 80 80
---student details---
name : neha
usn : 123
sem : 3
cie marks :
45 40 45 40 50
see marks :
90 95 90 95 100

```



```

---student details---
name : neha
usn : 123
sem : 3
cie marks :
45 40 45 40 50
see marks :
90 95 90 95 100
final marks in 5 courses
90 87 90 87 100
---student details---
name : nikhil
usn : 456
sem : 3
cie marks :
40 40 50 40 40
see marks :
80 80 100 80 80
final marks in 5 courses
80 80 100 80 80

C:\Users\Prashanth\Documents\java programs\lab6>

```

## Program 7

Write a program to demonstrate generics with multiple object parameters.

```

import
java.util.*;

class gen<T>{
    T ob;
    gen(T o){
        ob=o;
    }
    void show(){
        System.out.println("Value: "+ob);
        System.out.println("Type: "+ob.getClass().getName());
    }
}

class genericsprog{
    public static void main(String args[]){
        gen<Integer> obj1=new gen<Integer>(10);
        obj1.show();
        gen<String> obj2=new gen<String>("hello");
    }
}

```

```

        obj2.show();
    }
}

Value: 10
Type: java.lang.Integer
Value: hello
Type: java.lang.String

```

## Program 8

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 Wrong Age( ) when the input age=father’s age.

```

import
java.util.*;

class fatherAgeException extends Exception{
    public String toString(){
        return ("Father's age is less than 0");
    }
}

class sonAgeException extends Exception{
    int a;
    sonAgeException(int age){
        a=age;
    }
    public String toString(){
        if(a<0)
            return ("Son's age is less than 0");
        else
            return ("Son's age is more than father's age");
    }
}

class father{
    public int age1;
    Scanner s=new Scanner(System.in);
    father(){
        System.out.print("Enter father's age: ");
        age1=s.nextInt();
    }
    void ex1() throws fatherAgeException{

```

```

        if(age1<0)
            throw new fatherAgeException();
    }
}

class son extends father{
    public int age2;
    son(){
        System.out.print("Enter son's age: ");
        age2=s.nextInt();
    }
    void ex2() throws sonAgeException{
        if(age2<0 || age2>super.age1)
            throw new sonAgeException(age2);
    }
}

class fatherson{
    public static void main(String args[]){
        son s=new son();
        try{
            s.ex1();
        }
        catch(fatherAgeException e){
            System.out.println(e);
        }
        try{
            s.ex2();
        }
        catch(sonAgeException e){
            System.out.println(e);
        }
    }
}

```

```

Enter father's age: 45
Enter son's age: 60
Son's age is more than father's age

```

## Program 9

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 bms
implements
Runnable{

    Thread t1;
    bms(){
        t1=new Thread(this,"bms");
    }
    public void run(){
        try{
            for(int i=5;i>0;i--){
                System.out.println("BMS College of
Engineering");
                Thread.sleep(10000);
            }
        }
        catch(InterruptedException e){
            System.out.println("BMS interrupted\n");
        }
        System.out.println("Exiting: "+t1);
    }
}

class cse implements Runnable{
    Thread t2;
    cse(){
        t2=new Thread(this,"cse");
    }
    public void run(){
        try{
            for(int i=5;i>0;i--){
                System.out.println("CSE");
                Thread.sleep(2000);
            }
        }
        catch(InterruptedException e){
            System.out.println("CSE interrupted\n");
        }
        System.out.println("Exiting: "+t2);
    }
}

class threadprg{
    public static void main(String args[]){
        bms obj1=new bms();
```

```

        cse obj2=new cse();
        obj1.t1.start();
        obj2.t2.start();
    }
}

```

```

CSE
BMS College of Engineering
CSE
CSE
CSE
CSE
Exiting: Thread[cse,5,main]
BMS College of Engineering
BMS College of Engineering
BMS College of Engineering
BMS College of Engineering
Exiting: Thread[bms,5,main]

```

## Program 10

Write a program that creates a user interface to perform integer divisions.

```

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 dividend:");

        // 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();
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);
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!");
    }
}

});

// display frame
jfrm.setVisible(true);
}

public static void main(String args[]){
    // create frame on event dispatching thread
    SwingUtilities.invokeLater(new Runnable(){
        public void run(){
            new SwingDemo();
        }
    });
}
}

```



