

LAB 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.

PROGRAM

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.

```
import java.util.*;
import java.math.*;
public class quadratic {
    public static void main (String args[]) {
        Scanner in = new Scanner (System.in);
        System.out.println ("Enter the value of a");
        double a = in.nextDouble();
        System.out.println ("Enter the value of b");
        double b = in.nextDouble();
        System.out.println ("Enter the value of c");
        double c = in.nextDouble();
        if (a != 0) {
            double d = b*b - (4*a*c);
            if (d > 0.0) {
                double r1 = (-b + Math.pow(d, 0.5)) / (2*a);
                double r2 = (-b - Math.pow(d, 0.5)) / (2*a);
                System.out.println ("The roots are real and distinct");
            }
            else if (d == 0.0) {
                double r1 = -b / (2*a);
                System.out.println ("The roots are real and equal");
                System.out.println ("The root is " + r1);
            }
            else {
                System.out.println ("The roots are imaginary");
            }
        }
        else {
            System.out.println ("Invalid Inputs");
        }
    }
}
```

OUTPUT
Enter the value of a
1
Enter the value of b
1
Enter the value of c
1
The roots are real and distinct

OUTPUT

```
Microsoft Windows [Version 10.0.22000.978]
(c) Microsoft Corporation. All rights reserved.

C:\Users\Avani>cd C:\Users\Avani\Desktop\quadratic equation
C:\Users\Avani\Desktop\quadratic equation>javac quad.java
C:\Users\Avani\Desktop\quadratic equation>java quad.java
Enter the value of a,b and c:
1 2 1
The roots are real and equal. The root is -1.0

C:\Users\Avani\Desktop\quadratic equation>java quad.java
Enter the value of a,b and c:
1 2 3
The roots are imaginary. The roots are -1.0+0.41421356237309515i and -1.0-2.414213562373095i

C:\Users\Avani\Desktop\quadratic equation>java quad.java
Enter the value of a,b and c:
1 50 50
The roots are real and distinct. The roots are -1.0208423834364027 and -48.9791576165636

C:\Users\Avani\Desktop\quadratic equation>
```

LAB 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.

PROGRAM

```
Program -2
import java.util.Scanner;
class student
{
    void display (String name, String usn)
    {
        System.out.println("usn of the student: " + usn);
        System.out.println("name of the student: " + name);
    }
    void calculateSgpa (double[] marks, double[] credits,
        int number)
    {
        double gradePoints[] = new double[number];
        double sgpa, sum = 0, tsum = 0;
        for (int i = 0; i < number; i++)
        {
            if (marks[i] >= 90)
                gradePoints[i] = 10;
            else if (marks[i] >= 80 && marks[i] < 90)
                gradePoints[i] = 9;
            else if (marks[i] >= 70 && marks[i] < 80)
                gradePoints[i] = 8;
            else if (marks[i] >= 60 && marks[i] < 70)
                gradePoints[i] = 7;
            else if (marks[i] >= 50 && marks[i] < 60)
                gradePoints[i] = 6;
        }
    }
}
```

```
else if (marks[i] >= 40 && marks[i] < 50)
    gradePoints[i] = 5;
else
    gradePoints[i] = 0;
for (int i = 0; i < number; i++)
{
    sum = credits[i] * gradePoints[i];
    for (int i = 0; i < number; i++)
    {
        tsum = credits[i];
    }
    sgpa = sum / tsum;
    System.out.println("sgpa is " + sgpa);
}
class Sgpa {
    public static void main (String args[])
    {
        Scanner s = new Scanner (System.in);
        System.out.println("enter name and usn of the student");
        String name = s.next();
        String usn = s.next();
    }
}
```

```

Student s1 = new Student();
System.out.println("enter number of courses");
int number = s1.nextInt();
double credits[] = new double[number];
double marks[] = new double[number];
for (int i=0; i< number; i++)
{
    System.out.println("credit of the subject");
    credits[i] = s1.nextDouble();
    System.out.println("marks of the subject");
    marks[i] = s1.nextDouble();
}
s1.display(name, usn);
s1.calculatesgpa(marks, credits, number);
}
}

```

OUTPUT

```

C:\Users\Avani\Desktop\1bm21cs036>java sgpa
enter name and usn of the student
Avani 1BM21CS036
enter number of courses
5
credit of the subject1:
4
marks of the subject1:
60
credit of the subject2:
3
marks of the subject2:
70
credit of the subject3:
3
marks of the subject3:
80
credit of the subject4:
2
marks of the subject4:
50
credit of the subject5:
1
marks of the subject5:
100
usn of the student:1BM21CS036
name of the student:Avani
sgpa is 7.769230769230769
C:\Users\Avani\Desktop\1bm21cs036>S

```

LAB 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.

PROGRAM

```
LAB PROGRAM - 3
import java.util.*;
import java.lang.*;
class Book {
    String name, author;
    int price, num_pages;
    void getval() {
        Scanner sc = new Scanner(System.in);
        System.out.println("Enter book name, author name, price and number of pages");
        name = sc.next();
        author = sc.next();
        price = sc.nextInt();
        num_pages = sc.nextInt();
    }
    public String toString() {
        return name + " " + author + " " + price + "Rs" + num_pages + " pages";
    }
    void display (Book o) {
        System.out.println(o);
    }
}
```

```
class BookV {
    public static void main (String args[]) {
        Scanner sc = new Scanner(System.in);
        System.out.println("Enter the no. of books");
        int n = sc.nextInt();
        Book[] ob = new Book[n];
        for (int i = 0; i < n; i++)
            ob[i] = new Book();
        for (int i = 0; i < n; i++)
        {
            ob[i].getval();
        }
        for (int i = 0; i < n; i++)
        {
            ob[i].display (ob[i]);
        }
    }
}
```


OUTPUT

```
Microsoft Windows [Version 10.0.22000.1098]
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C:\Users\Avani>cd C:\Users\Avani\Desktop\1bm21cs036

C:\Users\Avani\Desktop\1bm21cs036>java Bookv
enter the no of books
2
enter book name,author name,price and number of pages
twilight stephanie 500 650
enter book name,author name,price and number of pages
inception rowling 750 1000
twilight stephanie 500Rs 650 pages
inception rowling 750Rs 1000 pages

C:\Users\Avani\Desktop\1bm21cs036>
```

LAB 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.

PROGRAM


```

class shape area {
    public static void main (String args[])
    {
        rectangle r1 = new rectangle (10,20);
        triangle t1 = new triangle (5,10);
        circle c1 = new circle (3,0);
        shape s;
        s = r1;
        s.print Area ();
        s = t1;
        s.print Area ();
        s = c1;
        s.print Area ();
    }
}

```

Output

Enter height and width of rectangle
30 40
Area of Rectangle is 1200

Enter height and base of triangle
30 60
Area of Triangle is 900

Enter radius of circle
50
Area of circle is 7850

OUTPUT

```

Microsoft Windows [Version 10.0.19043.2251]
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C:\Users\bmsce>cd C:\Users\bmsce\Desktop\IBM21C5036

C:\Users\bmsce\Desktop\IBM21C5036>javac lab4.java

C:\Users\bmsce\Desktop\IBM21C5036>java lab4
Enter height and width of rectangle
30 40
Area of Rectangle is 1200
Enter height and base of triangle
60 50
Area of Triangle is 1500.0
Enter radius of Circle
50
Area of Circle is 7854.0

C:\Users\bmsce\Desktop\IBM21C5036>

```

LAB 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.

PROGRAM

```

LAB PROGRAM #5
import java.util.Scanner;
import java.lang.Math;
class Account {
    String name, acc-type;
    int acc-no;
    double bal, dep;
    Scanner ss = new Scanner(System.in);
    void setd() {
        System.out.println("Enter your name:");
        name = ss.next();
        System.out.println("Enter your account number:");
        acc-no = ss.nextInt();
        System.out.println("Enter your account type (Savings/Current):");
        acc-type = ss.next();
        System.out.println("Enter the Bank Balance:");
        bal = ss.nextDouble();
    }
}

```

```

void disp() {
    System.out.println("Name: " + name);
    System.out.println("Account Number: " + acc-no);
    System.out.println("Account Type: " + acc-type);
    System.out.println("Current Balance: " + bal);
}

void deposit() {
    System.out.println("Enter the amount to be deposited:");
    dep = ss.nextDouble();
    bal = bal + dep;
    System.out.println("Balance amount: " + bal);
}

boolean acc(String acc-type) {
    if (acc-type == "Savings")
        return true;
    else if (acc-type == "Current")
        return false;
    else
        return false;
}
}

```

```

class cur-act extends Account {
    void penal() {
        double min, pen;
        System.out.println("Enter minimum & penalty amount if not followed:");
        min = ss.nextDouble();
        pen = ss.nextDouble();
        if (bal < min) {
            bal = min;
            System.out.println("penalty imposed for having insufficient balance");
        }
        else
            return;
    }

    void withdrawal() {
        double amt;
        System.out.println("Enter amount to be withdrawn:");
        amt = ss.nextDouble();
        int a = penal();
        if (a == 1)
            if (bal >= amt)

```

```

        bal = bal - amt;
        System.out.println("Account balance after withdrawal is: " + bal);
    }
    else
        System.out.println("The amount can't be withdrawn");
}

class sav-act extends Account {
    void calc-interest() {
        System.out.println("Enter time and rate of interest:");
        double t = ss.nextDouble();
        double r = ss.nextDouble();
        double CI = bal * Math.pow((1 + r) / 100, t);
        System.out.println("Compound Interest: " + CI);
        bal = bal + CI;
        System.out.println("Balance amount: " + bal);
    }
}

```

```

void withdrawal ()
{
    double amt;
    System.out.println("Enter amount to be withdrawn:");
    amt = ss.nextDouble();
    if (bal >= amt)
    {
        bal -= amt;
        System.out.println("Account Balance after withdrawal is: " + bal);
    }
    else
    {
        System.out.println("The amount can be withdrawn");
    }
}

class Bank {
    public static void main (String args[])
    {
        Scanner ss = new Scanner (System.in);
        Account a1 = new Account();
        a1.setel();
        if (a1.acc (a1.acc_type) == true)
    }
}

```

```

{
    sav - act s1 = new sav - act ();
    s1.name = a1.name;
    s1.acc_no = a1.acc_no;
    s1.acc_type = a1.acc_type;
    s1.bal = a1.bal;
    System.out.println("Enter your choice:");
    1. Deposit / 2. Calculate interest / 3. Withdraw / 4. Display / 5. Exit;
    int ch = ss.nextInt();
    switch (ch)
    {
        case 1: s1.deposit(); break;
        case 2: s1.calc_interest(); break;
        case 3: s1.withdrawal(); break;
        case 4: s1.display(); break;
        case 5: exit(0); break;
    }
    default: System.out.println("Invalid input");
}
} else
{
    cur - acc c1 = new cur - acc ();
    c1.name = a1.name;
    c1.acc_no = a1.acc_no;
}
}

```

```

c1.acc-type = a1.acc-type;
c1.bal = a1.bal;
system.out.println("Enter your
choice: /n 1. Deposit /n 2. Penalty check /n
3. Withdraw /n 4. Display /n 5. Exit");
int ch = ss.nextInt();
switch (ch) {
case 1: c1.deposit (); break;
case 2: c1.penal (); break;
case 3: c1.withdrawal (); break;
case 4: c1.display (); break;
case 5: exit (0); break;
default: system.out.println("Invalid input");
}
}
}
}

```

Output

```

(1) 1000 - 1000 = 0
(2) 1000 - 1000 = 0
(3) 1000 - 1000 = 0
(4) 1000 - 1000 = 0
(5) 1000 - 1000 = 0

```

OUTPUT

Command Prompt - java Lab5

```
Enter your account type:
1. Savings account
2. Current account
1
Cheque Facility not available
Enter customer name
hhhh
Enter hhhh's account number
555
Enter balance amount
60000
Customer Name:hhhh
Your account number:555
Your Account Balance:60000.0
Press 1 to deposit
1
Enter amount to be deposited
500
Enter rate of interest
4
Enter number of times interest applied per time period
4
Enter number of time periods
3
Interest amount-70776.44288000002
Balance amount without interest is60500.0
Available balance after updating is70776.44288000002
Press 1 to withdraw ammount
```

Ac
Go

LAB PROGRAM-6

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.

PROGRAM

```
import java.util.Scanner;

class WrongAgeException extends Exception {
    public String toString() {
        return ("Entered age is negative");
    }
}

class AgeException extends Exception {
    public String toString() {
        return ("Age entered of the father is greater than that of the son");
    }
}

class Father {
    int father_age;

    Father (int x) throws WrongAgeException {
        father_age = x;
        if (father_age < 0) {
            throw new WrongAgeException();
        }
    }
}
```

```
class Son extends Father {
    int son_age;

    Son (int x, int y) throws AgeException,
    WrongAgeException {
        super(x);
        son_age = y;
        if (son_age < 0) {
            throw new WrongAgeException();
        }
    }
}

class Son extends Father {
    int son_age;

    Son (int x, int y) throws AgeException,
    WrongAgeException {
        super(x);
        son_age = y;
    }
}
```

```

class Lab_7 {
    public static void main(String[] args) {
        try {
            Scanner s = new Scanner(System.in);
            System.out.println("Enter father's and son's ages");
            int x = s.nextInt();
            int y = s.nextInt();
            Son so = new Son(x, y);
            System.out.printf("Father is %d years old and son is %d years old", so.father, so.son-age);
        } catch (WrongAgeException wa) {
            System.out.println(wa);
        }
        catch (Exception e) {
            System.out.println("Enter valid values");
        }
    }
}

```

OUTPUT

```

Microsoft Windows [Version 10.0.19043.2251]
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:\Users\bmsce>CD C:\Users\bmsce\Desktop\1BM21CS036

:\Users\bmsce\Desktop\1BM21CS036>javac Lab_7.java

:\Users\bmsce\Desktop\1BM21CS036>java Lab_7
Enter father's and son's ages
60
30
Father is 60 years old and son is 30 years old

:\Users\bmsce\Desktop\1BM21CS036>java Lab_7
Enter father's and son's ages
0
0
Age entered of the son is greater than that of the father

:\Users\bmsce\Desktop\1BM21CS036>java Lab_7
Enter father's and son's ages
30
0
Entered age is negative

:\Users\bmsce\Desktop\1BM21CS036>

```

LAB PROGRAM-7

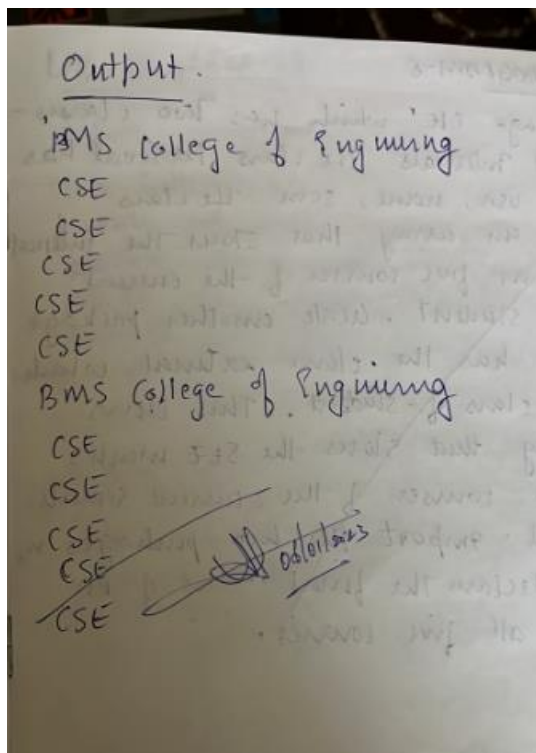
Write a

program which creates two threads, one thread displaying "BMS College of Engineering" once every ten seconds and another displaying "CSE" once every two seconds.

PROGRAM

```
class call implements Runnable
{
    String a;
    int x, time;
    Thread t;
    call (String tn, int ti, int ex)
    {
        a = tn;
        x = ex;
        time = ti;
        t = new Thread (this, a);
        t.start();
    }
    public void run()
    {
        try {
            for (int i = 0; i < x; i++)
            {
                System.out.println(a);
                Thread.sleep(time);
            }
        } catch (InterruptedException e) {
            System.out.println("Interrupted");
        }
    }
}

class Lab 8 -
{
    public static void main (String xx[])
    {
        new call ("BMS College of Engineering", 10000, 2);
        new call ("CSE", 2000, 10);
    }
}
```



OUTPUT

```
C:\Users\Avani\Desktop\1bm21cs036>java Threading
CSE
CSE
CSE
CSE
CSE
BMS college of engineering
CSE
BMS college of engineering
BMS college of engineering
BMS college of engineering
BMS college of engineering

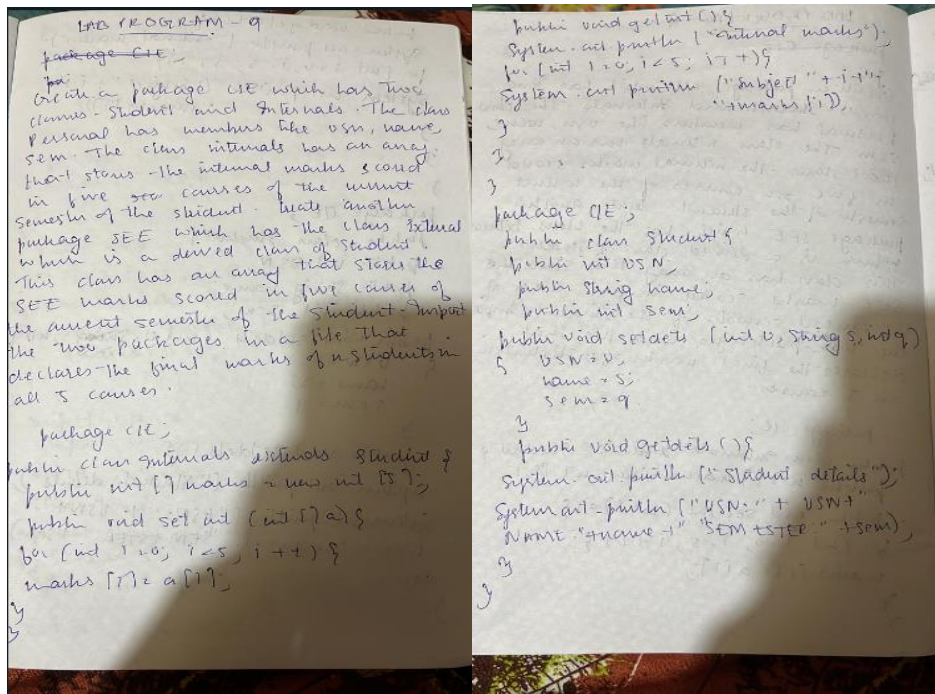
C:\Users\Avani\Desktop\1bm21cs036>
```

LAB PROGRAM-8

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.

PROGRAM




```

package SET;
import IE.*;

public class External extends Internal {
    public int[] marks; // new int[5];
    public void set (int[] a) {
        for (int i=0; i<5; i++) {
            marks[i] = a[i];
        }
    }
    public void get () {
        for (int i=0; i<5; i++) {
            System.out.println ("External marks");
            System.out.println ("Subject "+ i + " " + marks[i]);
        }
    }
}

import IE.*;
import SET.*;
import java.util.Scanner;

class Test {
    public static void main (String args[]) {
        Scanner s = new Scanner (System.in);
        System.out.println ("Enter number of students");
        int n = s.nextInt();
    }
}

```

```

External[] exts = new External[n];
for (int i=0; i<n; i++) {
    System.out.println ("Enter student details");
    int DSN = s.nextInt();
    String name = s.next();
    int sem = s.nextInt();

    System.out.println ("Enter internal marks");
    int[] intm = new int[5];
    for (int j=0; j<5; j++) {
        intm[j] = s.nextInt();
    }
    exts[i] = new External();
    exts[i].setDSN (DSN, name, sem);
    exts[i].setInt (intm);
}

System.out.println ("Enter external marks");
for (int j=0; j<5; j++) {
    int[] extm = s.nextInt();
}
for (int i=0; i<n; i++) {
    exts[i].getDSN();
    exts[i].getName();
    exts[i].getSem();
}

```

```

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

Output
Enter number of students
1
Enter student details
1 a 2
Enter external marks
12 12 12 12 12
Enter internal marks
12 12 12 12 12
DSN: 1
Name: a
sem: 2

Subject 1: 12
Subject 2: 12
Subject 3: 12
Subject 4: 12
Subject 5: 12

```

```

External marks
Subject 1: 12
Subject 2: 12
Subject 3: 12
Subject 4: 12
Subject 5: 12
Final marks
Subject 1: 18
Subject 2: 18
Subject 3: 18
Subject 4: 18
Subject 5: 18

```


OUTPUT

```
3
Enter customer number,customer name,item quantity,item price
1 qwe 5 5000
Enter customer number,customer name,item quantity,item price
2 rty 3 10000
Enter customer number,customer name,item quantity,item price
3 yui 6 20000
-----Customer Details-----

Customer number: 1
Customer name: qwe
Quantity: 5
Item price: 5000.0
Total price: 25000.0
Discount: 2500.0
Net price: 22500.0

-----Customer Details-----

Customer number: 2
Customer name: rty
Quantity: 3
Item price: 10000.0
Total price: 30000.0
Discount: 3000.0
Net price: 27000.0

-----Customer Details-----

Customer number: 3
Customer name: yui
Quantity: 6
Item price: 20000.0
Total price: 120000.0
Discount: 30000.0
Net price: 90000.0
```