LAB PROGRAM 1:

```
package labPrograms;
import java.util.Scanner;
public class roots {

	public static void main(String[] args) {
		double a,b,c,d;
		Scanner sc=new Scanner(System.in);
		System.out.println("Enter the value of a:");
		a=sc.nextDouble();
		System.out.println("Enter the value of b:");
		b=sc.nextDouble();
		System.out.println("Enter the value of c:");
		c=sc.nextDouble();
		d=((b*b)-(4*a*c));
		if(d>0)
		{distinct(a,b,d);}
		else if(d==0)
		{equal(a,b,d);}
		else {System.out.println("NO REAL ROOTS!");}
	}
	public static void distinct(double a, double b,double d)
	{
		double x=Math.sqrt(d);
		double r1=(-1*b+x)/(2*a);
		double r2=(-1*b-x)/(2*a);
		System.out.println("The two roots are  "+r1+"and  "+r2);
		}
	public static void equal(double a,double b,double d)
	{
		double x=Math.sqrt(d);
		double r1=(-1*b+x)/(2*a);
```

```
                System.out.println("The two roots are  "+r1+"and  "+r1);
        }

}
```

```
Microsoft Windows [Version 10.0.18362.1082]
(c) 2019 Microsoft Corporation. All rights reserved.

C:\Users\Harish>d:

D:\>cd/JAVA PROGRAMS

D:\JAVA PROGRAMS>javac roots.java

D:\JAVA PROGRAMS>java roots
Enter the value of a:
1
Enter the value of b:
-7
Enter the value of c:
12
The two roots are  4.0and  3.0

D:\JAVA PROGRAMS>
```

LAB PROGRAM 2:

```
package labPrograms;

import java.util.Scanner;


public class Student {
        String USN,name;
        int num,totalcred;
        int creditsarr[];
        int marksarr[];
        double SGPA;


        Student()
        {
```

```
            SGPA=0.0d;
    }
    void input()
    {
     Scanner sc=new Scanner(System.in);
     System.out.println("Enter your name:");
     name =sc.nextLine();
     System.out.println("Enter your USN:");
     USN=sc.nextLine();
     System.out.println("Enter the number of course:");
     num=sc.nextInt();
     marksarr=new int[num];
     creditsarr=new int[num];

     for(int i=0;i<num;i++)
     {
                System.out.println("Enter the credits for course "+(i+1)+":");
                creditsarr[i]=sc.nextInt();
                System.out.println("Enter the marks obtained in course  "+(i+1)+":");
                marksarr[i]=sc.nextInt();
                System.out.println();
     }
     sc.close();
    }
    void compute()
    {
            for(int i=0;i<num;i++)
            {
                    if(marksarr[i]==100)
                    {
                      SGPA=SGPA+(creditsarr[i]*marksarr[i]/10);
                    }
                    else if(marksarr[i]>=35&&marksarr[i]<100)
```

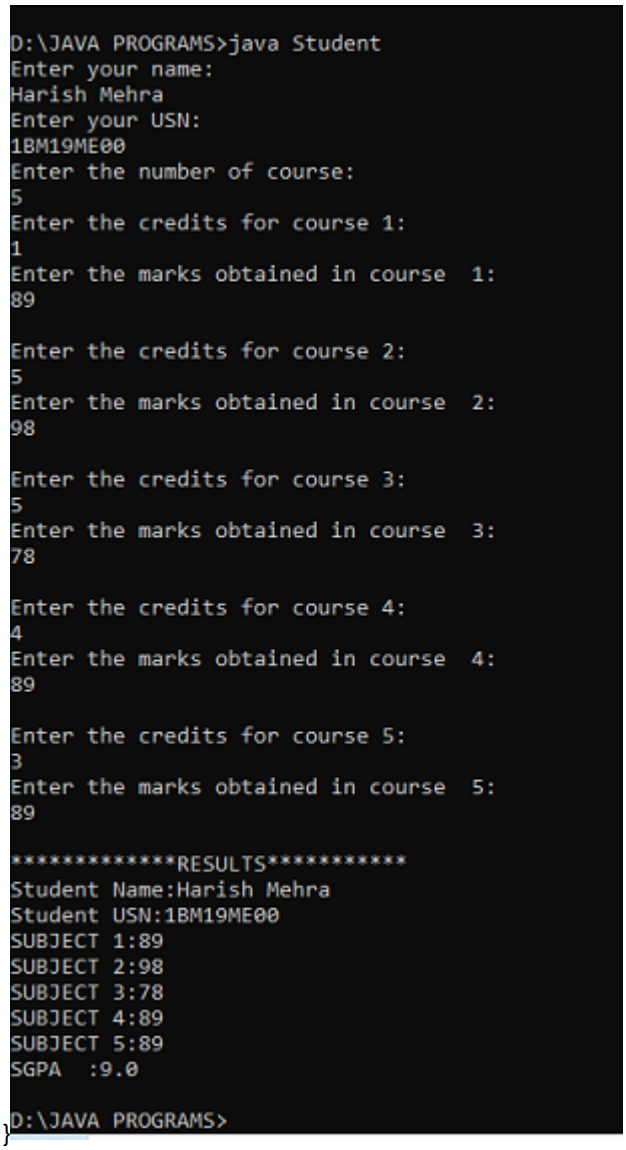
```
                {
                        SGPA=SGPA+(creditsarr[i]*((marksarr[i]/10)+1));
                }
                else
                {
                        SGPA=0;
                }
                totalcred+=creditsarr[i];
        }
        SGPA/=totalcred;
}
void display()
{
        System.out.println("*************RESULTS***********");
        System.out.println("Student Name:"+name);
        System.out.println("Student USN:"+USN);
        for(int i=0;i<num;i++)
        {
         System.out.println("SUBJECT "+(i+1)+":"+marksarr[i]);
        }
        System.out.println("SGPA  :"+SGPA);
}

public static void main(String[] args)
{

        Student result= new Student();
        result.input();
        result.compute();
        result.display();



}
```



}

LAB PROGRAM 3:

```
package labPrograms;

abstract class Shape {

int dim1;

int dim2;

Shape(int a, int b) {

dim1 = a;

dim2 = b;

}
```

```
abstract double area();
}
class Rectangle extends Shape {
Rectangle(int a, int b) {
super(a, b);
}

double area() {
System.out.println("Inside Area for Rectangle.");
return dim1 * dim2;
}
}
class Triangle extends Shape {
Triangle(int a, int b) {
super(a, b);
}

double area() {
System.out.println("Inside Area for Triangle.");
return dim1 * dim2 / 2;
}
}
class Circle extends Shape{
	Circle(int a,int b){
		super(a,b);
	}
	double area() {
		System.out.println("Inside area of Circle");
		return 3.14*dim1*dim1;
	}
}
```

```
public class AbstractAreas {

public static void main(String args[]) {


Rectangle r = new Rectangle(9, 5);

Triangle t = new Triangle(10, 8);

Shape shapef;

shapef = r;

System.out.println("Area is " + shapef.area());

shapef = t;

System.out.println("Area is " + shapef.area());

}

}
```

```
D:\JAVA PROGRAMS>javac AbstractAreas.java

D:\JAVA PROGRAMS>java AbstractAreas
Inside Area for Rectangle.
Area is 45.0
Inside Area for Triangle.
Area is 40.0

D:\JAVA PROGRAMS>
```

LAB PROGRAM 4:

```
package labPrograms;

import java.util.Scanner;


public class Book

{

        String name,author;

        int price,num_pages;


        void Book()

        {

                name="null";
```

```
		author="null";
		price=0;
		num_pages=0;
	}

	void input()
	{
		Scanner sc=new Scanner(System.in);
		System.out.println("Enter the name of the book:");
		 name=sc.next();
		System.out.println("Enter the author's name:");
		author=sc.next();
		System.out.println("Enter the number of pages:");
		num_pages=sc.nextInt();
		System.out.println("Enter the price:");
		price=sc.nextInt();

	}
	void output()
	{
		System.out.println("\n Name: "+name+"\n Author:  "+author+"\n Number of pages:
"+num_pages+"\n Price:  "+price);

	}
	public String toString() {
		return("\n Name: "+name+"\n Author:  "+author+"\n Number of pages:  "+num_pages+"\n
Price:  "+price);
	}

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

```
                Scanner sc=new Scanner(System.in);
                int n,ch;
                System.out.println("Enter the number of books:");
                n=sc.nextInt();
                Book b[]=new Book[n];
                for(int i=0;i<n;i++)
                {
                        b[i]=new Book();
                        b[i].input();
                }
                System.out.println("*******************************");
                System.out.println("1.Function Method\n2.String method");
                System.out.println("*****************\nEnter choice:");
                ch=sc.nextInt();
                switch(ch)
                {
                case 1:for(int i=0;i<n;i++)
                    {b[i].output();}
                     break;
                case 2:for(int i=0;i<n;i++)
                     {System.out.println(b[i]);}
                     break;
                default:System.out.println("Invalid choice.");



                }



        }

}
```

```
D:\JAVA PROGRAMS>java Book
Enter the number of books:
2
Enter the name of the book:
Inferno
Enter the author's name:
Dan Brown
Enter the number of pages:
480
Enter the price:
250
Enter the name of the book:
Oliver Twist
Enter the author's name:
Charles Dickens
Enter the number of pages:
280
Enter the price:
200
*******************************
1.Function Method
2.String method
*****************
Enter choice:
2

 Name: Inferno
 Author:  Dan Brown
 Number of pages:  480
 Price:  250

 Name: Oliver Twist
 Author:  Charles Dickens
 Number of pages:  280
 Price:  200
```

LAB PROGRAM 5:

```
package test;

import java.util.Scanner;



public class Account

{
```

```
String name,temp;
int acc_num;
char acc;
double deposit;
double balance=0;
Scanner sc= new Scanner (System.in);

void input_data()
{
        System.out.println("Enter the type of account?");
        temp=sc.nextLine();
        acc=temp.charAt(0);
}
void deposit()
{
        System.out.println("Enter the amount to be deposit:");
        deposit=sc.nextDouble();
        balance +=deposit;
        System.out.println("Amount"+deposit+ "has been created");
}
void display_balance()
{
        System.out.println("Balance:"+balance);
}
public static void main(String args[]) {
        int x;
        Scanner s= new Scanner(System.in);
        Account a1=new Account();
        a1.input_data();
        if(a1.acc=='c'||a1.acc=='C')
        {
                current c1=new current();
                do {
```

```
                    System.out.println("**********Current Account**********");
                    System.out.println("1.Deposit.");
                    System.out.println("2.Check Balance.");
                    System.out.println("3.Issue cheque.");
                    System.out.println("4.Exit.");
                    System.out.println("Enter the choice:");
                    x=s.nextInt();
                    switch(x)
                    {
                    case 1:c1.deposit();
                    break;
                    case 2:c1.display_balance();
                    break;
                    case 3:c1.cheque();
                    break;
                    case 4:System.exit(0);
                    break;
                    default:System.out.println("ENter choice is not valid.");
                    }
            }while(x<=4&&x>=1);
    }
    else if(a1.acc=='S'||a1.acc=='s')
    {
            savings s1= new savings();
            do {
                    System.out.println("**********savings Account**********");
                    System.out.println("1.Deposit.");
                    System.out.println("2.Check Balance.");
                    System.out.println("3.Withdraw.");
                    System.out.println("4.Calculate compound interest.");
                    System.out.println("5.Exit.");
                    System.out.println("Enter the choice:");
                    x=s.nextInt();
```

```
                    switch(x)
                    {
                    case 1:s1.deposit();
                    break;
                    case 2:s1.display_balance();
                    break;
                    case 3:s1.withdraw();
                    break;
                    case 4:s1.compute_cmp();
                    case 5:System.exit(0);
                    break;
                    default:System.out.println("ENter choice is not valid.");
                    }
                }while(x<=5&&x>=1);
                }
                else
                    System.out.println("Invalid account type.");

            }

            }
```

```
 class savings extends Account
{
        double comp,withdraw,time;
        savings()
        {System.out.println("ENter the name:");
        name=sc.nextLine();
```

```
System.out.println("Enter the account number:");
acc_num=sc.nextInt();
deposit();
}

void compute_cmp()
{
System.out.println("Enter the time period:");
time=sc.nextDouble();
comp=balance*Math.pow(1+(0.08/12),12*time)-balance;
System.out.println("Compound Interest:"+comp);
balance+=comp;
System.out.println("The compound interest has been added to the balance.");
}
void withdraw()
{
System.out.println("Enter the amount to withdraw:");
withdraw=sc.nextDouble();
if(withdraw>balance) {System.out.println("Not sufficient balance.");}
else
{balance=balance-withdraw;
System.out.println("Amount "+withdraw+" has been withdrawn.");
}
}
}
class current extends Account
{
current()
{
System.out.println("Enter your name:");
name=sc.nextLine();
System.out.println("ENter the account number:");
acc_num=sc.nextInt();
```

```
deposit();
}
double chq_amt;
void cheque()
{
        System.out.println("ENter the amount for the cheque:");
        chq_amt=sc.nextDouble();
        if(chq_amt>balance)
        {System.out.println("Sorry,Not enough balance!");}
        else {balance=balance-chq_amt;
        System.out.println("Cheque has been issued.");}
}
void check_balance()
{
        if(balance<1000)
        {System.out.println("Current balance is less than min. required balance.");
        balance=balance-100;}
        display_balance();
}
}
```

```
D:\JAVA PROGRAMS>java Account
Enter the type of account?
c
Enter your name:
Harish Mehra
ENter the account number:
198037
Enter the amount to be deposit:
20000
Amount20000.0has been created
***********Current Account**********
1.Deposit.
2.Check Balance.
3.Issue cheque.
4.Exit.
Enter the choice:
2
Balance:20000.0
***********Current Account**********
1.Deposit.
2.Check Balance.
3.Issue cheque.
4.Exit.
Enter the choice:
2
Balance:20000.0
***********Current Account**********
1.Deposit.
2.Check Balance.
3.Issue cheque.
4.Exit.
Enter the choice:
```

LAB PROGRAM 6:

```
package SEE;

        import java.util.Scanner;

        public class Externals extends CIE.Student

        { public int see[]=new int[5];

         Scanner get=new Scanner(System.in);

public void getm()

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

 { System.out.println("Subject "+(1+i));

  see[i]=get.nextInt(); }
```

```
   }
    public void dispsm()
     {for(int i=0;i<5;i++)
     { System.out.printf("%d\t",see[i]); }
      }
      }
package CIE;
import java.util.Scanner;
public class Internals extends Student
{ public int cie[]=new int[5];
  Scanner get=new Scanner(System.in);
   public void geti()
   { System.out.println("Enter Details: ");
    System.out.println("USN :");
    usn = get.next();
    System.out.println("NAME :");
    name =get.next();
    System.out.println("SEMESTER :");
    sem =get.nextInt();
    System.out.println("CIE MARKS :");
    for(int i=0;i<5;i++)
    { System.out.println("Subject "+(1+i));
     cie[i]=get.nextInt(); }
      }
       public void dispi()
        { System.out.println("\nUSN :"+usn);
         System.out.println("NAME :"+name);
         System.out.println("SEMESTER :"+sem);
         System.out.println("CIE :");
         for(int i=0;i<5;i++)
         { System.out.printf("%d\t",cie[i]); }
         System.out.println("\nSEE :");
          }
```

```
        }
package CIE;
public class Student
{
public String usn;
public String name;
public int sem;
}

import java.util.Scanner;
    import CIE.*;
    import SEE.*;
    class TotalMarks
    { public static void main(String args[])
     { Scanner get=new Scanner(System.in);
      int n;
      System.out.println("Enetr the no of students: ");
      n=get.nextInt();
       CIE.Internals ints[]=new CIE.Internals[n];
       SEE.Externals exts[]=new SEE.Externals[n];
        for(int i=0;i<n;i++)
        { ints[i]=new CIE.Internals();
         exts[i]=new SEE.Externals();
          ints[i].geti();
           System.out.println("SEE MARKS :");
            exts[i].getm();
            }
            for(int i=0;i<n;i++)
            { ints[i].dispi();
             int total=0;
              exts[i].dispsm();
               for(int j=0;j<5;j++)
                { total=total+ints[i].cie[j]+exts[i].see[j];}
```

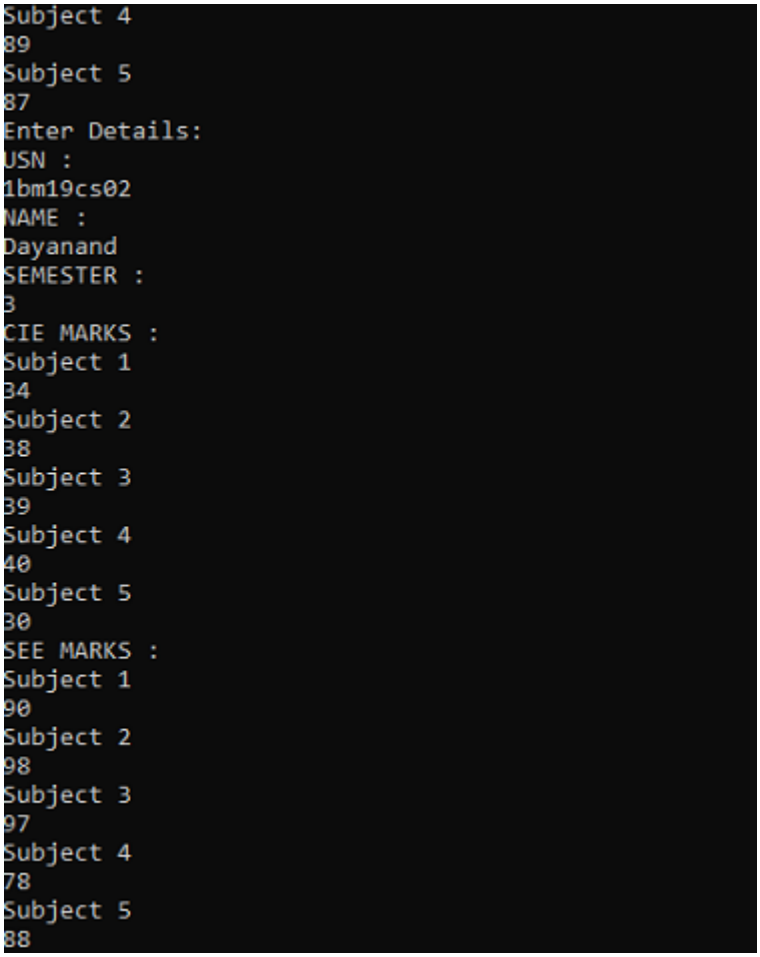
```
System.out.println("\nTOTAL MARKS : "+total);
}
 }
 }
```

```
D:\JAVA PROGRAMS>java TotalMarks
Enetr the no of students:
2
Enter Details:
USN :
1Bm19cs01
NAME :
Harish
SEMESTER :
3
CIE MARKS :
Subject 1
33
Subject 2
34
Subject 3
43
Subject 4
40
Subject 5
24
SEE MARKS :
Subject 1
89
Subject 2
87
Subject 3
78
```

```
USN :1Bm19cs01
NAME :Harish
SEMESTER :3
CIE :
33      34      43      40      24
SEE :
89      87      78      89      87
TOTAL MARKS : 604

USN :1bm19cs02
NAME :Dayanand
SEMESTER :3
CIE :
34      38      39      40      30
SEE :
90      98      97      78      88
TOTAL MARKS : 632

D:\JAVA PROGRAMS>
```



LAB PROGRAM 7:

```
class Gen<A,B,C>

{

A iob;

B strob;

C dob;

Gen(A io,B so,C doj)

{

iob=io;

strob=so;
```

```
dob=doj;
}
A getiob()
{return iob;}
B getstrob()
{return strob;}
C getdob()
{return dob; }
void showType()
{
System.out.println("Types:\n 1."+iob.getClass().getName());
System.out.println("2."+strob.getClass().getName());
System.out.println("3."+dob.getClass().getName());
}
}

class GenTest
{
public static void main(String args[])
{
Gen<Integer,String,Double> obj=new Gen<Integer,String,Double>(14,"Lingardinho",9.58001);
obj.showType();
int i=obj.getiob();
String str=obj.getstrob();
double d=obj.getdob();
System.out.println("Values:");
System.out.println("1. "+i);
System.out.println("2. "+str);
System.out.println("3. "+d);
}
}
```

```
D:\JAVA PROGRAMS>javac GenTest.java

D:\JAVA PROGRAMS>java GenTest
Types:
 1.java.lang.Integer
2.java.lang.String
3.java.lang.Double
Values:
1. 14
2. Lingardinho
3. 9.58001

D:\JAVA PROGRAMS>_
```

LAB PROGRAM

```
import java.util.Scanner;

class AgeException1 extends Exception

{ private int sa,fa;

AgeException1(int a,int b)

 { sa = a;

  fa = b; }

   public String toString()

   { return "age.Exception.FAther's age can't be less than son's age."; }

   }

   class AgeException2 extends Exception

   { private int sa,fa;

    AgeException2(int a,int b)

     { sa = a;

      fa = b; }

       public String toString()

       { return "age.Exception.Age(<0)"; }

       }

       class Father
```

```
        { int Fage; }
        class Son extends Father
        { int Sage;
         String Sname;
Son(int age,int fage) throws AgeException1, AgeException2
 { Sage=age;

   Fage=fage;
    System.out.println("Son Name: " + Sname);
     System.out.println("Son age: " + Sage);
      System.out.println("Father age " + Fage);
if(Sage<0||Fage<0)
 throw new AgeException2(age,fage);
  if(age>=fage)
   throw new AgeException1(age,fage);
    }
    }
    class AgeExceptionDemo
    { public static void main(String args[])
     { int sa,fa; String name;
      Scanner get=new Scanner(System.in);

        System.out.println("Enter Son age: ");
         sa=get.nextInt();
          System.out.println("Enter Father age ");
           fa=get.nextInt();
            try
             { Son s=new Son(sa,fa); }
              catch (AgeException1 e)
               { System.out.println("Caught " + e); }
               catch (AgeException2 e)
                { System.out.println("Caught " + e); }
                 }
```

```
}
```

```
D:\JAVA PROGRAMS>java AgeExceptionDemo
Enter Son age:
23
Enter Father age
18
Son Name: null
Son age: 23
Father age 18
Caught age.Exception.FAther's age can't be less than son's age.

D:\JAVA PROGRAMS>java AgeExceptionDemo
Enter Son age:
17
Enter Father age
-21
Son Name: null
Son age: 17
Father age -21
Caught age.Exception.Age(<0)

D:\JAVA PROGRAMS>
```

LAB PROGRAM

```
import java.util.Random;

class Square extends Thread

{

 int x;

 Square(int n)

 {

 x = n;

 }

 public void run()

 {

 int sqr = x * x;

 System.out.println("Square of " + x + " = " + sqr );

 }
```

HARISH SINGH MEHRA

```
}
class Cube extends Thread
{
 int x;
 Cube(int n)
 {
 x = n;
 }
 public void run()
 {
 int cub = x * x * x;
 System.out.println("Cube of " + x + " = " + cub );
 }
}
class Number extends Thread
{
 public void run()
 {
 Random random = new Random();
 for(int i =0; i<10; i++)
 {
 int randomInteger = random.nextInt(100);
 System.out.println("Random Integer generated : " + randomInteger);
 if(randomInteger%2==0)
 {

            System.out.println("Integer is even.");
            Square s = new Square(randomInteger);
    s.start();
 }
 else
 {
            System.out.println("Integer is odd.");
```

```
    Cube c = new Cube(randomInteger);
    c.start();
 }
 try {
 Thread.sleep(1000);

 } catch (InterruptedException ex) {
 System.out.println(ex);
}
 }
 }
}
public class labthread {
 public static void main(String args[])
 {
 Number n = new Number();
 n.start();
 }
}
class NewThread implements Runnable {
   String name;
   Thread t;
   NewThread(String threadName) {
   name = threadName;
   t = new Thread(this, name);
   System.out.println("New thread: " + t);
   t.start();
                    }
   public void run() {
         try {
            if (t.getName().equals("One"))
                                          {
             for (int i = 5; i > 0; i--)
```

```
                                        {
            System.out.println("BMS College of Engineering");
            Thread.sleep(10000);
            }
          }
          else{
              for (int i = 20; i > 0; i--) {
               System.out.println("CSE");
                        Thread.sleep(2000);
                                }
                                  }
                                   }
                    catch(InterruptedException e){
                                System.out.println(name + "Interrupted");

                    }
                            System.out.println(name + " exiting.");
        }
}

public class Main {

   public static void main(String[] args) {
        new NewThread("One");
             new NewThread("Two");
               }
               }
class NewThread implements Runnable {
          int sum=0;
   String name;
   Thread t;
   NewThread(String threadName) {
   name = threadName;
```

```
   t = new Thread(this, name);
   System.out.println("New thread: " + t);
   t.start();
      }

                  public void run()
                  {

                        {
                              for(int i=1;i<100;i=i+2)
                              {
                                    sum+=i;
                              }
                              System.out.println("The sum of the odd numbers is: "+sum);
                        }

                        System.out.println(name + " exiting.");
                  }

}
public class Main2{

   public static void main(String[] args) {
                  int sume=0;

        new NewThread("Odd");
                        Thread t2=Thread.currentThread();
                        System.out.println("Main Thread "+t2);
                        t2.setName("Main Thread");

                              for(int i=0;i<100;i=i+2)
                              {
                                    sume+=i;
```

```
                    }
                    System.out.println("The sum of the odd numbers is: "+sume);


            System.out.println( "main exiting.");

}
}
```

```
D:\JAVA PROGRAMS>javac Main.java

D:\JAVA PROGRAMS>java Main
New thread: Thread[One,5,main]
New thread: Thread[Two,5,main]
BMS College of Engineering
CSE
CSE
CSE
CSE
CSE
BMS College of Engineering
CSE
CSE
CSE
CSE
CSE
BMS College of Engineering
CSE
CSE
CSE
CSE
CSE
BMS College of Engineering
CSE
CSE
CSE
CSE
CSE
BMS College of Engineering
Two exiting.
One exiting.
```

Command Prompt

```
D:\JAVA PROGRAMS>java labthread
Random Integer generated : 33
Integer is odd.
Cube of 33 = 35937
Random Integer generated : 88
Integer is even.
Square of 88 = 7744
Random Integer generated : 15
Integer is odd.
Cube of 15 = 3375
Random Integer generated : 81
Integer is odd.
Cube of 81 = 531441
Random Integer generated : 24
Integer is even.
Square of 24 = 576
Random Integer generated : 8
Integer is even.
Square of 8 = 64
Random Integer generated : 76
Integer is even.
Square of 76 = 5776
Random Integer generated : 4
Integer is even.
Square of 4 = 16
Random Integer generated : 13
Integer is odd.
Cube of 13 = 2197
Random Integer generated : 92
Integer is even.
Square of 92 = 8464
```

```
D:\JAVA PROGRAMS>javac Main2.java

D:\JAVA PROGRAMS>java Main2
New thread: Thread[Odd,5,main]
Main Thread Thread[main,5,main]
The sum of the odd numbers is: 2450
main exiting.
The sum of the odd numbers is: 2500
Odd exiting.

D:\JAVA PROGRAMS>
```

LAB PROGRAM

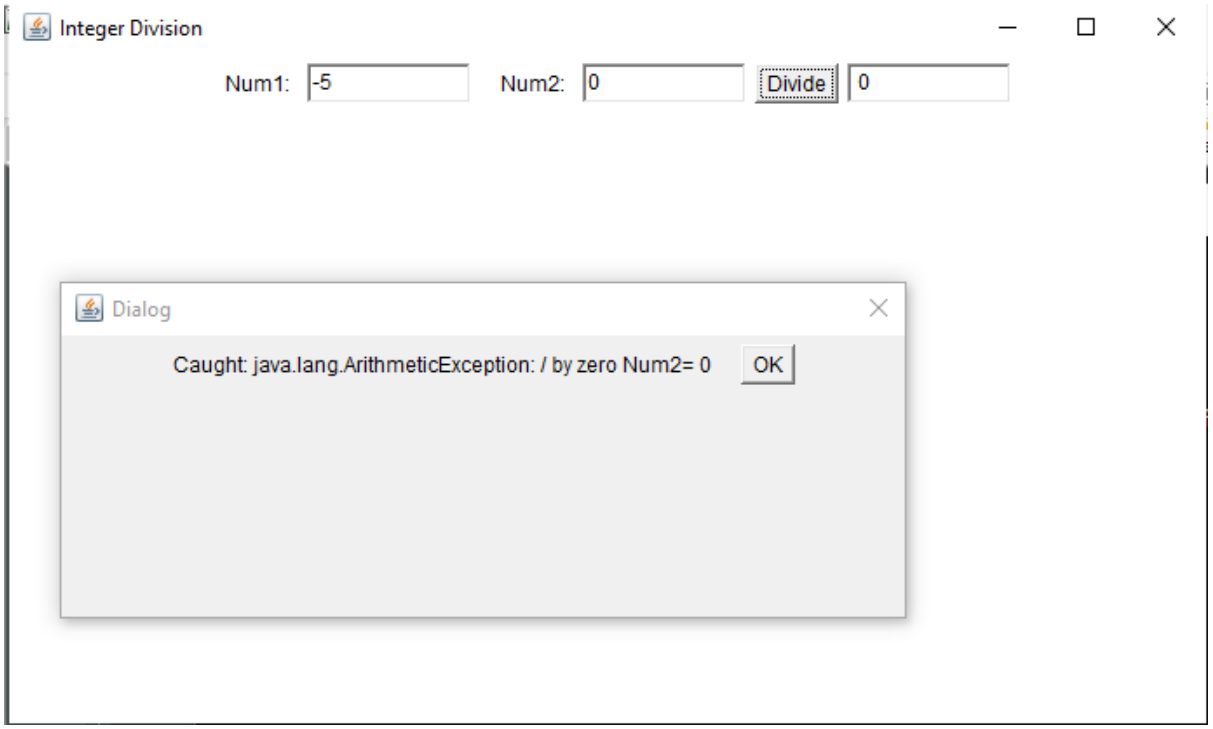
```
import java.awt.*;

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

```
class SampleDialog extends Dialog implements ActionListener
{ IntDivUp idu;
SampleDialog(Frame parent, String title)
{ super(parent, title, false);
idu=(IntDivUp)parent;
setLayout(new FlowLayout());
setSize(500, 200);
add(new Label(idu.errmsg));
Button b;

add(b = new Button("OK"));
b.addActionListener(this);
}
public void actionPerformed(ActionEvent ae)
{ dispose(); }
}
public class IntDivUp extends Frame implements ActionListener
{ TextField Num1, Num2,Result;
Button Divide;
String errmsg="";
public IntDivUp()
{ setLayout(new FlowLayout());
Divide = new Button("Divide");
Label Num1p = new Label("Num1: ", Label.RIGHT);
Label Num2p = new Label("Num2: ", Label.RIGHT);
Num1 = new TextField(10);
Num2 = new TextField(10);
Result = new TextField(10);
add(Num1p);
add(Num1);
add(Num2p);
add(Num2);
add(Divide);
```

```
add(Result);
Divide.addActionListener(this);
addWindowListener(new WindowAdapter(){
public void windowClosing(WindowEvent we)
{ System.exit(0); }
});
}
public void actionPerformed(ActionEvent ae)
{
int a=0,b=1,r=0;
try
{a = Integer.parseInt(Num1.getText());
b = Integer.parseInt(Num2.getText());}
catch(NumberFormatException e)
{ errmsg= "Caught: "+e;
SampleDialog d = new SampleDialog(this, "Dialog");
d.setVisible(true); }
try
{ r=a/b; }
catch(ArithmeticException e)
{ errmsg= "Caught: "+e+" Num2= "+ b;
SampleDialog d = new SampleDialog(this, "Dialog");
d.setVisible(true); }
Result.setText(" "+r);
}
public static void main(String args[])
{ IntDivUp appwin = new IntDivUp();
appwin.setSize(new Dimension(700,700));
appwin.setTitle("Integer Division");
appwin.setVisible(true);
}
}
```


Integer Division
Num1:
-5
Num2:
0
Divide
0
Dialog
Caught: java.lang.ArithmeticException: / by zero Num2= 0
OK