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Lab 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.

```
import java.util.*;

class quadratic

{

	public static void main(String args[])

	{

		Scanner sc=new Scanner(System.in);

		int a,b,c;

		double d,r1,r2;

		System.out.println("enter values of a b and c in a quadratic equation");

		a=sc.nextInt();

		b=sc.nextInt();

		c=sc.nextInt();

		d=b*b-(4*a*c);

		if(d<0)

			System.out.println("no real solution");

		else

		{

			d=Math.sqrt(d);

			r1=(-b+d)/(2.0*a);

			r2=(-b-d)/(2.0*a);

			System.out.println("roots are real ");

			System.out.println(" roots of the equation are  "+r1+" and "+r2);

		}

	}
```

}

Java prog

Q. To print real solutions of quadratic equation $ax^2 + bx + c = 0$. Read a, b and c & use quadratic formula. If discriminate $b^2 - 4ac$ is negative display a message stating that there are not real solutions.

```
import java.util.*;
class quadrati
{
    public static void main ( String args[] )
    {   Scanner sc = new Scanner (System.in);
        int a, b, c;
        double d, r1, r2;
        System.out.println(" Enter values of a b and
                c in a quadratic equation ");
        a = sc.nextInt();
        b = sc.nextInt();
        c = sc.nextInt();
        d = b*b - (4*a*c);
        if (d < 0)
          System.out.println(" no real solution ");
        else
        {   d = Math.sqrt (d);
            r1 = (-b+d) / (2.0*a);
            r2 = (-b-d) / (2.0*a);
          SOPln (" roots are. " + r1 + " and "
                + r2 );
        }
    }
}
```

```
C:\Users\Prashanth\Documents\java programs>javac quadratic.java

C:\Users\Prashanth\Documents\java programs>java quadratic
enter values of a b and c in a quadratic equation
1 -3 10
no real solution

C:\Users\Prashanth\Documents\java programs>java quadratic
enter values of a b and c in a quadratic equation
1 -3 -10
roots are real
 roots of the equation are  5.0 and -2.0

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

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.

```
import java.util.*;
class student
{
        String usn,name;
        static int credits[];
        static double marks[];
        void input(int n)
        {
                Scanner sc=new Scanner(System.in);
                System.out.println("enter usn and name ");
                usn=sc.nextLine();
                name=sc.nextLine();
                System.out.println("enter marks along with credits");
                for(int i=0;i<n;i++)
```

```
            {
                        marks[i]=sc.nextDouble();
                        credits[i]=sc.nextInt();
                        System.out.println();
            }
  }
  double calculate(int n)
  {
            int c,cred=0;
            double tot,total=0.0;
            for(int i=0;i<n;i++)
            {
                        tot=marks[i];
                        if(tot>=90)
c=10;
else if(tot>=80)
c=9;
else if(tot>=70)
c=8;
else if(tot>=60)
c=7;
else if(tot>=50)
c=6;
else if(tot>=40)
                        c=4;
                else
                        c=0;
                total=total+(c*credits[i]);
                        cred=cred+credits[i];
            }
            total=total/cred;
```

```
            return(total);
        }
        void display(int n,float total)
        {
            System.out.println("name of student : "+name);
            System.out.println("usn of student : "+usn);
            System.out.println("marks of student along with credits of course");
            for(int i=0;i<n;i++)
            {
                System.out.println(marks[i]+"   "+credits[i]);
            }
            System.out.println("sgpa of student : "+total);
        }
        public static void main(String args[])
        {
            Scanner sc=new Scanner(System.in);
            student obj=new student();
            System.out.println("enter no of course ");
            int n=sc.nextInt();
            credits=new int[n];
            marks=new double[n];
            obj.input(n);
            double total=obj.calculate(n);
            float res=(float)total;
            obj.display(n,res);
        }
}
```

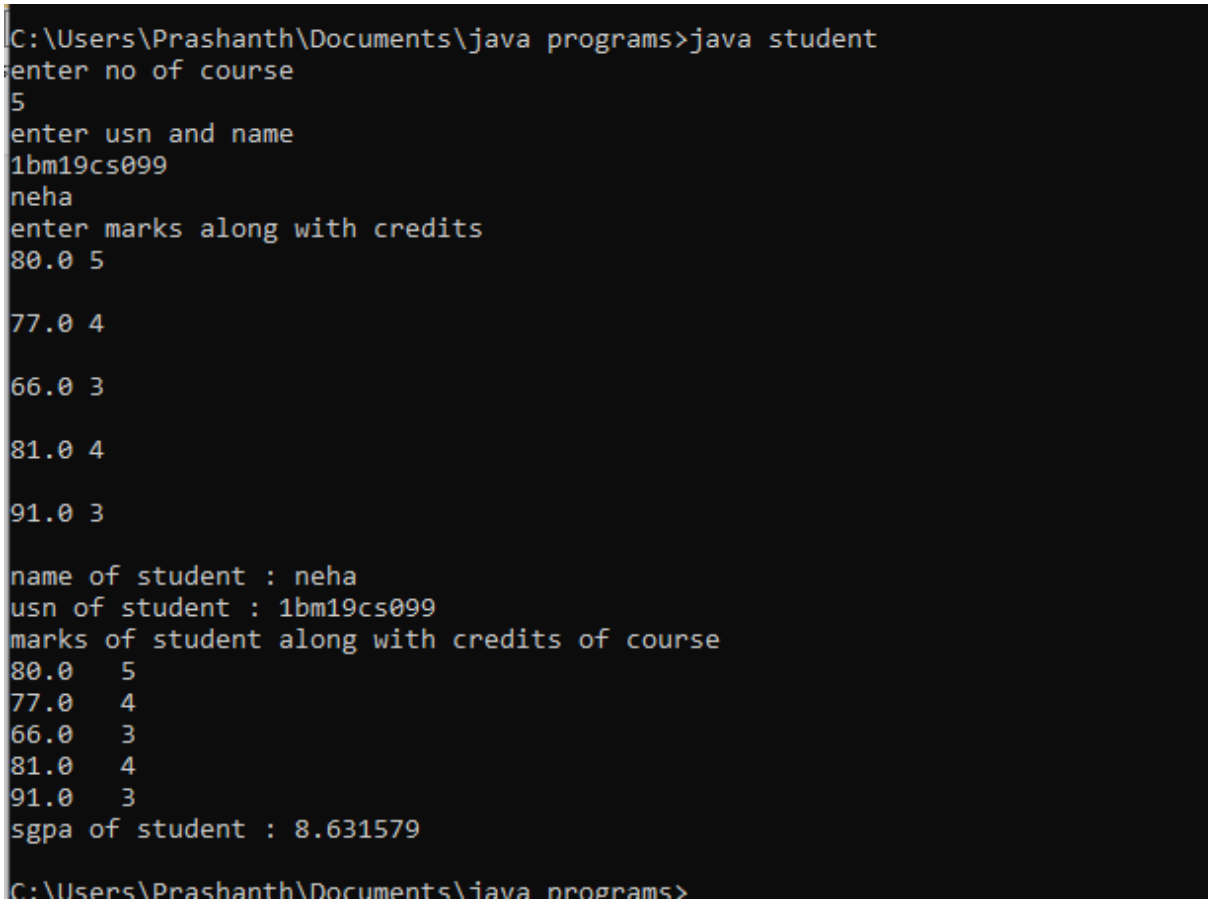
Lab Program 2:

Develop java program to create class student with members usn, name, an array credits and an array marks. Include method to accept data display and calculate sgpa of a student

```
import java.util.*;
class student
{
    String usn, name;
    static int credits[];
    static double marks[];
    void input(int n)
    {
        Scanner sc = new Scanner (System.in);
        System.out.println(" Enter usn and name");
        usn = sc.nextLine();
        name = sc.nextLine();
        System.out.println(" Enter marks along with
                            credits ");
        for(int i=0; i<n; i++)
        {
            marks[i] = sc.nextDouble();
            credits[i] = sc.nextInt();
            sop1n();
        }
    }
    double calculate(int n)
    {
        int c, cred = 0;
        double tot, total = 0.0;
```

```
for (int i=0; i<n; i++)
{   tot = marks[i];
    if (tot ≥ 90)
    c = 10;
    else if (tot ≥ 80)
    c = 9;
    else if (tot ≥ 70)
    c = 8;
    else if (tot ≥ 60)
    c = 7;
    else if (tot ≥ 50)
    c = 6;
    else if (tot ≥ 40)
    c = 4;
    else
    c = 0;
    total = total + (c * credits[i]);
    cred = cred + credits[i];
    }
    total = total / cred;
    return (total);
}
void display (int n, float total)
{   System.out.println("Name : " + name);
    System.out.println("USN : " + usn);
    System.out.println("Marks with credits :");
    for (int i=0; i<n; i++)
        System.out.println(marks[i] + " " + credits[i]
    System.out.println("SGPA : " + total);
}
```

```
public static void main(String args[])
{
    Scanner sc = new Scanner(System.in);
    Student obj= new Student();
    System.out.println("enter no. of course:");
    int n = sc.nextInt();
    credits = new int[n];
    marks = new double[n];
    obj.input(n);
    double total = obj.calculate(n);
    float res = (float) total;
    obj.display(n, res);
}
}
```



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.

```
import java.util.*;
class book
{
        String name,author;
        int price,num_pages;
        book(String nam,String a,int p,int nno)
        {
```

```
        name=nam;
        author=a;
        price=p;
        num_pages=no;
}
static String accept_name()
{
        Scanner sc=new Scanner(System.in);
        System.out.println("enter name of the book");
        return(sc.nextLine());
}
static String accept_author()
{
        Scanner sc=new Scanner(System.in);
        System.out.println("enter name of the author");
        return(sc.nextLine());
}
static int accept_price()
{
        Scanner sc=new Scanner(System.in);
        System.out.println("enter price of the book");
        return(sc.nextInt());
}
static int accept_pages()
{
        Scanner sc=new Scanner(System.in);
        System.out.println("enter no of pages of the book");
        return(sc.nextInt());
}
public String toString()
{
```

```
        return("name : "+name+"\n author :  "+author+"\n price :  "+price+"\n no of pages :
"+num_pages);
    }

    public static void main(String args[])
    {
        Scanner sc=new Scanner(System.in);
        int n;
        System.out.println("enter value of n");
        n=sc.nextInt();
        String nam,a;
        int p,no;
        book []obj=new book[n];
        for(int i=0;i<n;i++)
        {
            nam=accept_name();
          a=accept_author();
            p=accept_price();
            no=accept_pages();
            obj[i]=new book(nam,a,p,no);
        }
        int x=1;
        for(int i=0;i<n;i++)
        {
            System.out.println("BOOK "+(x++));
            System.out.println(obj[i]);
        }

    }
}
```

LAB Program - 3.

```
import java.util.*;
class book
{   String name, author;
    int price, num_pages;
    book(String nam, String a, int p, int no)
    {
        name = nam;
        author = a;
        price = p;
        num_pages = no;
    }
    static String accept_name()
    {
        Scanner sc = new Scanner(System.in);
        SOPln("Enter name of book");
        return(sc.nextLine());
    }
    static String accept_author()
    {
        Scanner sc = new Scanner(System.in);
        SOPln("Enter author name");
        return(sc.nextLine());
    }
    static int accept_price()
    {   Scanner sc = new Scanner(System.in);
        SOPln("Enter price of book");
        return(sc.nextInt());
    }
    static int accept_pages()
    {   Scanner sc = new Scanner(System.in);
        SOPln("Enter no. of pages");
        return(sc.nextInt());
    }
```

```
public String toString()
{
    return (name + " " + author + " " + price + "
            + num_pages);
}
Public static void main (String args[])
{   Scanner sc = new Scanner (System.in);
    int n;
    SOPln(" Enter value of n ");
    n = sc.nextInt();
    String nam, a;
    int p, no;
    book []obj = new book[n];
    for (int i=0; i<n; i++)
    {
        name = accept_name();
        a = accept_author();
        p = accept_price();
        no = accept_pages();
        obj[i] = new book(nam, a, p, no);
    }
    int x = 1;
    for (int i=0; i<n; i++)
    { System.out.println (" BOOK "+(x++));
      System.out.println (obj[i]);
    }

  }
}
```

```
C:\Users\Prashanth\Documents\java programs>java book
enter value of n
3
enter name of the book
harry potter
enter name of the author
jk rowlings
enter price of the book
750
enter no of pages of the book
1200
enter name of the book
moby
enter name of the author
jake wills
enter price of the book
550
enter no of pages of the book
800
enter name of the book
sherlock holmes
enter name of the author
robin
enter price of the book
650
enter no of pages of the book
955
```

```
BOOK 1
name : harry potter
 author :  jk rowlings
 price :  750
 no of pages :  1200
BOOK 2
name : moby
 author :  jake wills
 price :  550
 no of pages :  800
BOOK 3
name : sherlock holmes
 author :  robin
 price :  650
 no of pages :  955

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

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.

```
/*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.*;
abstract class shape
{
	int a,b;
	abstract void printArea();
}
class rectangle extends shape
{
	float area_rec;
	void printArea()
	{
		area_rec=a*b;
		System.out.println("area of rectangle = "+area_rec);
	}
}
class triangle extends shape
{
	float area_tri;
	void printArea()
	{
		area_tri=0.5f*a*b;
```

```
                System.out.println("area of triangle = "+area_tri);
        }
}
class circle extends shape
{
        float area_cir;
        void printArea()
        {
                area_cir=3.14f*a*a;
                System.out.println("area of circle = "+area_cir);
        }
}
class area_shapes
{
        public static void main(String args[])
        {
                Scanner sc=new Scanner(System.in);
                rectangle a1=new rectangle();
                System.out.println("enter length and breath of rectangle");
                a1.a=sc.nextInt();
                a1.b=sc.nextInt();
                a1.printArea();
                triangle a2=new triangle();
                System.out.println("enter base and height of triangle");
                a2.a=sc.nextInt();
                a2.b=sc.nextInt();
                a2.printArea();
                circle a3=new circle();
                System.out.println("enter radius of circle");
                a3.a=sc.nextInt();
                a3.printArea();
```

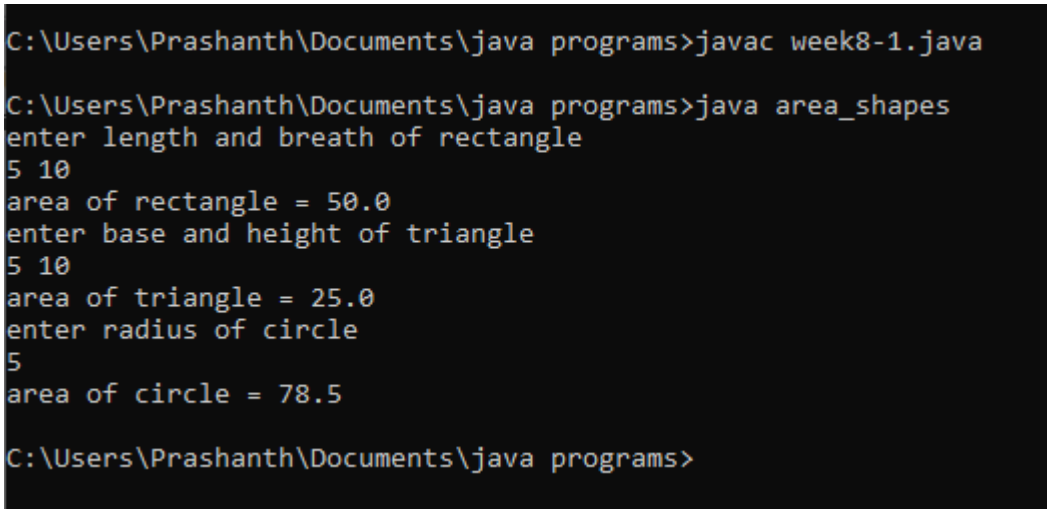
}

}

Week 8
Lab 4

```
import java.util.*;
abstract class shape
{
    int a, b;
    abstract void printArea();
}
class rectangle extends shape
{
    float area_rec;
    void printArea()
    { area_rec = a*b;
      System.out.println(" area of rectangle
                = " + area_rec);
    }
}
class triangle extends shape
{   float area_tri;
    void printArea()
    { area_tri = 0.5f * a * b;
      System.out.println(" area of triangle = "
                + area_tri);
    }
}
class circle extends shape
{   float area_cir;
    void printArea()
    {   area_cir = 3.14f * a * a;
        System.out.println(" area of circle = "
                + area_cir);
    }
}
```

```
class area_shapes
{
    public static void main (String args[])
    {
        Scanner sc= new Scanner (System.in);
        rectangle a1 = new rectangle ();
        System.out.println(" Enter length and
            breath of rectangle ");
        a1.a = sc.nextInt();
        a1.b = sc.nextInt();
        a1.printArea ();
        triangle a2 = new triangle ();
        System.out.println(" Enter base and
            height of triangle");
        a2.a = sc.nextInt();
        a2.b = sc.nextInt();
        a2.printArea ();
        circle a3 = new circle ();
        System.out.println(" Enter radius
            of circle ");
        a3.a = sc.nextInt();
        a3.printArea ();
    }
}
```



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 Curr-acct and Sav-acct to make them more specific to their requirements. Include the necessary methods in order to achieve the following tasks: • Accept deposit from customer and update the balance. • Display the balance. • Compute and deposit interest • Permit withdrawal and update the balance • Check for the minimum balance, impose penalty if necessary and update the balance

```
import java.util.*;
class account
{
        String cust_name;
        long acc_no;
        double balance;
        int type_acc;
        void input()
        {
```

```
                Scanner sc=new Scanner(System.in);
                System.out.println("-----enter account details-----");
                System.out.println("enter customer name ");
                cust_name=sc.nextLine();
                System.out.println("enter customer account number");
                acc_no=sc.nextLong();
                System.out.println("enter customer's account type 1.savings account 2.current
account");
                type_acc=sc.nextInt();
                System.out.println("enter customer's balance amount in account");
                balance=sc.nextDouble();
        }
        void display()
        {
                System.out.println("-----customer's account details-----");
                System.out.println("customer name\t"+cust_name);
                System.out.println("customer account number\t"+acc_no);
                System.out.println("customer's account type\t"+type_acc);
                System.out.println("customer's balance amount in account\t"+balance);
        }
        void deposit()
        {
                                Scanner sc=new Scanner(System.in);
                double amt;
                System.out.println("enter amount to be deposited ");
                amt=sc.nextDouble();
                balance=balance+amt;
                System.out.println("customer's balance amount in account\t"+balance);
        }
}
class Sav_acct extends account
```

```
{
        double interest;
        void compute_interest()
        {
                Scanner sc=new Scanner(System.in);
                int rate,time;
                System.out.println("enter rate and time period ");
                rate=sc.nextInt();
                time=sc.nextInt();
                interest=balance*Math.pow(1+rate/100.0,time)-balance;
                System.out.println("compound interest = "+interest);
                balance=balance+interest;
                System.out.println("customer's balance amount in account\t"+balance);
        }
        void withdrawal()
        {
                Scanner sc=new Scanner(System.in);
                double with;
                System.out.println("enter amount to be withdrawn");
                with=sc.nextDouble();
                if(with>balance)
                        System.out.println("withdrawal not possible due to insufficiant balance");
                else
                {
                        balance=balance-with;
                   System.out.println("customer's balance amount in account\t"+balance);
                }
        }
        void check()
        {
                double penalty;
```

```
                if(balance<2000.0)
                {
                        penalty=200.0;
                        balance=balance - penalty;
                        System.out.println("balance amount lesser than minimum balance");
                        System.out.println("penalty of Rs.200");
                   System.out.println("customer's balance amount in account\t"+balance);
                }
        }
}
class Curr_acct extends account
{
        void withdrawal()
        {
                Scanner sc=new Scanner(System.in);
                double with;
                System.out.println("enter amount to be withdrawn");
                with=sc.nextDouble();
                if(with>balance)
                        System.out.println("withdrawal not possible due to insufficiant balance");
                else
                {
                        balance=balance-with;
                   System.out.println("customer's balance amount in account\t"+balance);
                }
        }
        void check()
        {
                double penalty;
                if(balance<2000.0)
                {
```

```
                penalty=200.0;
                balance=balance - penalty;
                System.out.println("balance amount lesser than minimum balance");
                System.out.println("penalty of Rs.200");
            System.out.println("customer's balance amount in account\t"+balance);
        }
        else
                System.out.println(" balance amount greater than minimum balance \n no penalty");
    }
}
class bank
{
    public static void main(String args[])
    {
    Sav_acct o1=new Sav_acct();
    Curr_acct o2=new Curr_acct();
        Scanner sc=new Scanner(System.in);
    System.out.println("enter customer's account type 1.savings account 2.current account");
    int ch=sc.nextInt();
    int n=0;
    if(ch==1)
    {
        o1.input();
        o1.display();
        while(n!=3)
        {
        System.out.println("enter 1.deposit 2.withdrawal 3.exit");
        n=sc.nextInt();
        if(n==1)
           o1.deposit();
```

```
        if(n==2)
                        o1.withdrawal();
                    }
                    o1.compute_interest();
                    o1.check();
            }
            else if(ch==2)
            {
                    o2.input();
                    o2.display();
                    while(n!=3)
                    {
                    System.out.println("enter 1.deposit 2.withdrawal 3.exit");
                    n=sc.nextInt();
                    if(n==1)
                        o2.deposit();
        if(n==2)
                        o2.withdrawal();
                    }
                    o2.check();
            }
            else
                    System.out.println("invalid choice");

}
}
```

Week 8
Lab 5

banking.

```
import java.util.*;
class account
{   String cust_name;
    long acc_no;
    double balance;
    int type_acc;
    void input()
    {   Scanner sc = new Scanner(System.in);
        SOP("------enter account details--");
        SOP("Enter customer name");
        cust_name = sc.nextLine();
        SOP("Enter customer account number");
        acc_no = sc.nextLong();
        SOP("Enter account type 1. savings account
             2. current account");
        type_acc = sc.nextInt();
        SOP("Enter customer's balance amount");
        balance = sc.nextDouble();
    }
  void display()
{ SOP("---customer's account details--");
  SOP("customer name \t"+ cust_name);
  SOP("customer account number \t"+ acc_no);
  SOP("customer's account type \t" + type_acc);
  SOP("balance amount in account \t"+ balance);
}
```

```
    void deposit()
    { Scanner sc = new Scanner(System.in);
      double amt;
      SOP("Enter amount to be deposited");
      amt = sc.nextDouble();
      balance = balance + amt;
      display();
    }
}
class sav_acct extends account
{   double interest
    void compute_interest()
    { Scanner sc = new Scanner(System.in);
      int rate, time;
      SOP("Enter rate and time period");
      rate = sc.nextInt();
      time = sc.nextInt();
      interest = balance * Math.pow(1+rate/100.0,
                 time) - balance;
      balance = balance + interest;
      SOP("compound interest = "+interest);
      SOP("Customer's balance amount = "+balance);
    }
    void withdrawal()
    { Scanner sc = new Scanner(System.in);
      double with
      SOP("Enter amount to be withdrawn");
      with = sc.nextDouble();
      if(with > balance)
        SOP("withdrawal not possible due to
            insufficient balance");
```

```
        else
        {   balance = balance - with;
            SOP(" customer's balance amount=" + balance);
        }
    }
    void check().
    {   double pen;
        if (balance < 2000.0)
        {   pen = 200.0.
            balance = balance - pen;
            SOP (" Penalty : " + pen);
            SOP (" customer's balance amount=" + balance);
        }
    }
    class Curr_acct extends account
    {
        void withdrawl()
        {   Scanner sc = new Scanner(System.in);
            double with
            SOP (" Enter amount to be withdrawn ");
            with = sc.nextDouble();
            balance if (with > balance)
                SOP(" Insufficient balance ");
            else
            {   balance = balance - with;
                SOP(" customer's balance amount =" +
                        balance);
            }
        }
```

```
void check()
{   double pen;
    if (balance<2000.0)
    {   pen = 200.0;
        balance = balance - pen;
        SOP("penalty: "+pen);
        SOP("customer balance ="+balance);
    }
}
}

class bank
{   public static void main (string args[])
    {
        Sav_acct o1 = new Sav_acct();
        Cur_acct o2 = new Cur_acct();
        SOP(" 1. Savings account 2. current
            account ");
        int ch=sc.nextInt();
        int n=0;
        if (ch == 1)
        {
            o1.input();
            o1.display();
            while (n!= 3)
            {   SOP(" 1. deposit 2. withdrawal 3. exit");
                n=sc.nextInt();
                if (n==1)
                    o1.deposit();
                if(n==2)
                    o1.withdrawal();
            }
            o1.compute_interest();
            o1.check();
        }
```

```
else if (ch == 2)
{       o2.input();
        o2.display();
        while (n!=3)
      { SOP (" 1.deposit 2.withdraw 3.exit ");
        n=sc.nextInt();
        if (n==1)
           o2.deposit();
        if( n==2 )
           o2.withdrawal();
      }
     o2.check();
}
else
   SOP("Invalid choice");
}
}
```

```
C:\Users\Prashanth\Documents\java programs>javac week8-2.java

C:\Users\Prashanth\Documents\java programs>java bank
enter customer's account type 1.savings account 2.current account
1
-----enter account details-----
enter customer name
neha
enter customer account number
123456
enter customer's account type 1.savings account 2.current account
1
enter customer's balance amount in account
5000.0
-----customer's account details-----
customer name   neha
customer account number 123456
customer's account type 1
customer's balance amount in account    5000.0
```

```
enter 1.deposit 2.withdrawal 3.exit
1
enter amount to be deposited
1000.0
customer's balance amount in account    6000.0
enter 1.deposit 2.withdrawal 3.exit
2
enter amount to be withdrawn
4000.0
customer's balance amount in account    2000.0
enter 1.deposit 2.withdrawal 3.exit
3
enter rate and time period
5 2
compound interest = 205.0
customer's balance amount in account    2205.0

C:\Users\Prashanth\Documents\java programs>javac week8-2.java
```

```
neha
enter customer account number
123456
enter customer's account type 1.savings account 2.current account
2
enter customer's balance amount in account
10000.0
-----customer's account details-----
customer name   neha
customer account number 123456
customer's account type 2
customer's balance amount in account    10000.0
enter 1.deposit 2.withdrawal 3.exit
2
enter amount to be withdrawn
5000.0
customer's balance amount in account    5000.0
enter 1.deposit 2.withdrawal 3.exit
2
enter amount to be withdrawn
4000.0
customer's balance amount in account    1000.0
enter 1.deposit 2.withdrawal 3.exit
3
balance amount lesser than minimum balance
penalty of Rs.200
customer's balance amount in account    800.0

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

Lab 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.

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 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();
	}

}



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();
        }

}


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();
        }
    }
}
```

Lab Program 6

```
package CIE;
import java.util.*;
public class Student
{
    public String usn, name;
    public int Sem;
    public void input()
    {
        Scanner sc = new Scanner(System.in);
        SOP System.out.println("--enter details--");
        SOP("name : ");
        name = sc.nextLine();
        SOP("usn : ");
        usn = sc.nextLine();
        SOP("Sem : ");
        sem = sc.nextInt();
    }
    public void display()
    {
        System.out.println("-- student details --");
        "; (" name);
        "; (usn);
        "; (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);
        SOPln("Enter cie marks ");
        for(int i=0; i<5; i++).
            cie_marks[i] = sc.nextInt();
    }
    public void display()
    {
        SOP("cie marks : ");
        for(int i=0; i<5; i++)
            SOP(cie_marks[i]);
    }
}
```

```
Package SEE
import CIE.*;
import java.util.*;
public class External extends CIE.Students
{
    public int see_marks[] = new int[5];
    public void input()
    {
        Scanner sc = new Scanner(System.in);
        System.out.println("enter see marks");
        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.println(see_marks[i]);
    }
}
```

```
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);
        SOPln("enter no. of students");
        int n = sc.nextInt();
        CIE.Student []o1 = new CIE.Student[n];
        CIE.Internals []o2 = new CIE.Internals[n];
        SEE.Externals []o3 = new SEE.Externals[n];
        main []obj = new main[n];
        for(int i = 0; i<n ; i++)
        {   o2[i] = new CIE.Student();
            o2[i] = new CIE.~~Stude~~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].internals[j]
            + (o3[i].see_marks[j] / 2);
    }
```

```
for(int i=0 ; i<n ; i++)
{
    o1[i].display1();
    o2[i].display();
    o3[i].display();
    SOP(" final marks : ");
    for(int j=0 ; j<5 ; j++)
        SOP(obj[i].final_marks[j]);
}
}
}
```

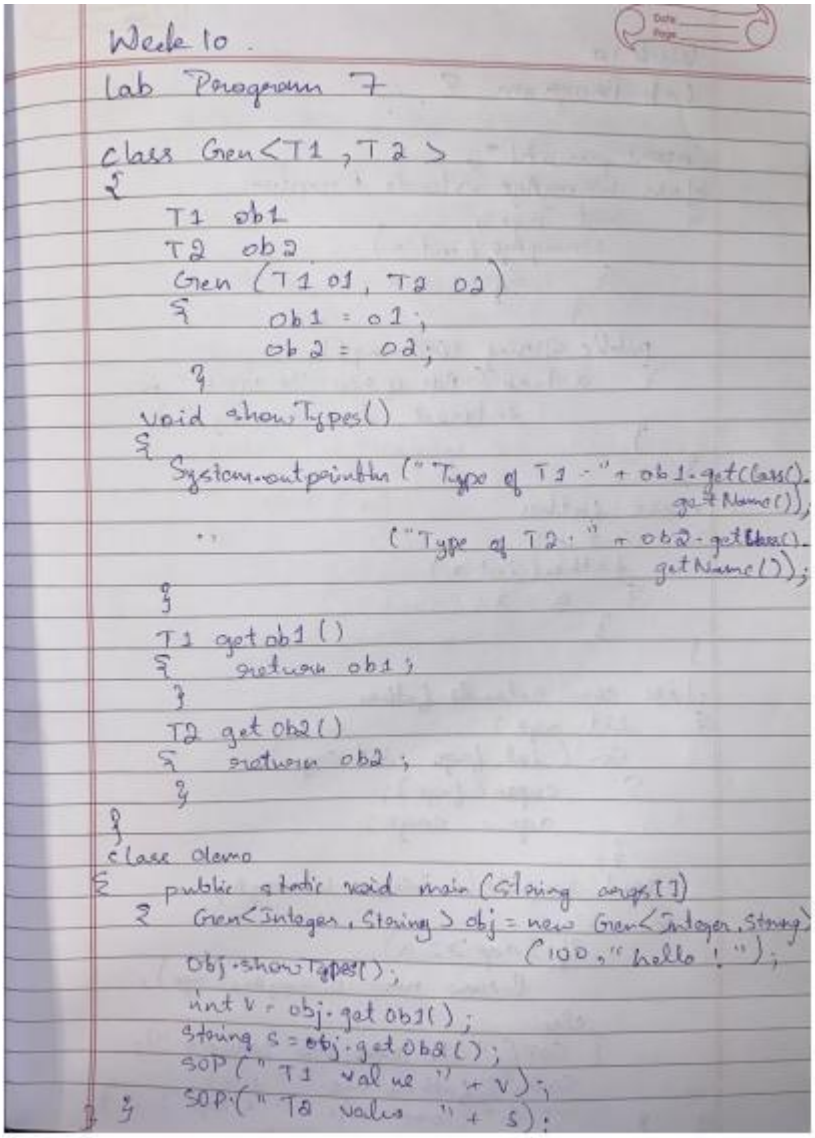
```
C:\Users\Prashanth\Documents\java programs\lab6>java main
enter no of students
2
---enter student details---
name  : neha
usn  : 123
sem  : 3

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>
```

Lab Program 7:

```
class Gen<T1, T2>
{
        T1 ob1;
   T2 ob2;
   Gen(T1 o1, T2 o2)
        {
      ob1 = o1;
      ob2 = o2;
        }

 void showTypes()
 {
 System.out.println("Type of T1 is " +ob1.getClass().getName());
 System.out.println("Type of T2 is " +ob2.getClass().getName());
 }
 T1 getob1() {
 return ob1;
 }
 T2 getob2() {
 return ob2;
 }
}
class demo
{
 public static void main(String args[])
{
```

```
Gen<Integer, String> obj = new Gen<Integer, String>(100, "hello!");
obj.showTypes();
int v = obj.getob1();
System.out.println("T1 value: " + v);
String str = obj.getob2();
System.out.println("T2 value: " + str);
}
}
```



```
C:\Users\Prashanth\Documents\java programs>javac week10-1.java

C:\Users\Prashanth\Documents\java programs>java demo
Type of T1 is java.lang.Integer
Type of T2 is java.lang.String
T1 value: 100
T2 value: hello!

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

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

class S_Ex extends Exception
{
	int a;
```

```
	S_Ex(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 age_f;
	father(int a)
	{
		age_f=a;
	}
	void ex1() throws F_Ex
	{
		if(age_f<0)
			throw new F_Ex();
	}
}

class son extends father
{
```

```
	public int age_s;
	son(int a,int b)
	{
		super(a);
		age_s=b;
	}
	void ex2() throws S_Ex
	{
		if(age_s<0 || age_s>age_f)
			throw new S_Ex(age_s);
	}
}

class fatherson
{
	public static void main(String args[])
	{
		Scanner sc=new Scanner(System.in);
		System.out.print("Enter father's age: ");
		int a=sc.nextInt();
		System.out.print("Enter son's age: ");
		int b=sc.nextInt();
		son s=new son(a,b);
		try
		{
			s.ex1();
		}
		catch(F_Ex e)
		{
```

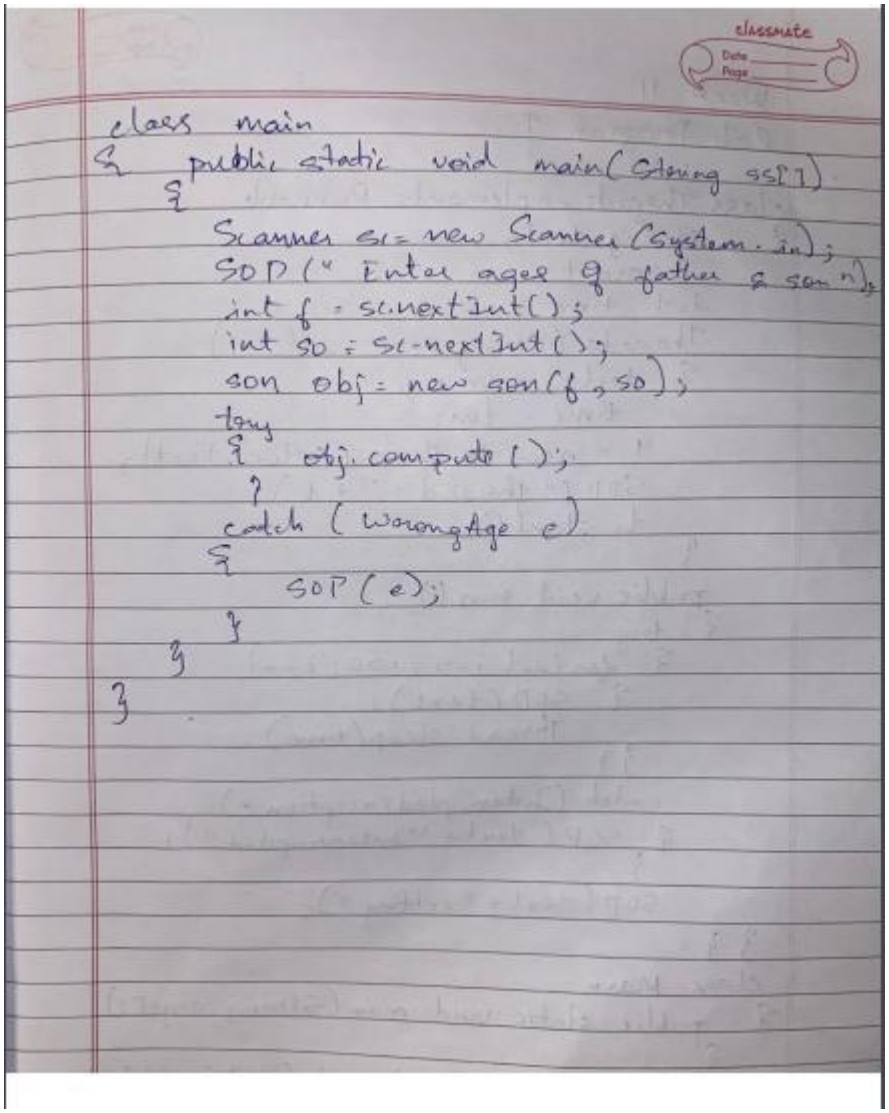
```
                        System.out.println(e);
                }
                try
                {
                        s.ex2();
                }
                catch(S_Ex e)
                {
                        System.out.println(e);
                }
        }
}*/


import java.util.Scanner;
class WrongAge extends Exception{
   int age;
   WrongAge(int x)
   {
      age=x;
   }
  public String toString()
   {
      return "AGE OF SON="+age+" IS ENTERED INCORRECTLY";
   }
}
class father
{
 int a;
```

```
 father(int x)
 {
a=x;
 }
}
class son extends father{
   int age;
   son(int fage,int sage){
      super(fage);
      age=sage;
   }

   void compute() throws WrongAge{
      if(age>=a)
      {
         throw new WrongAge(age);
      }
      else{
         System.out.println("THE AGES ARE ENTERED CORECTLY");
         System.out.println("FATHER'S AGE="+a+"\t"+"SON'S AGE="+age);
      }
   }

}

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

```
        Scanner s=new Scanner(System.in);
        System.out.println("ENTER FATHER'S AGE");
        int f=s.nextInt();
        System.out.println("ENTER SON'S AGE");
        int so=s.nextInt();
        son ss=new son(f,so);
        try{
           ss.compute();
        }catch(WrongAge e)
        {
           System.out.println(e);
        }
    }
}
```

Lab Program 8.

```
import java.util.*;
class WrongAge extends Exception
{   int age;
    WrongAge(int x)
    {   age = x;
    }
  public String toString()
  {  return("Age of son = "+ age + " is
          entered incorrectly");
  }
}
class father
{  int a;
   father(int x)
   {  a = x;
   }
}
class son extends father
{  int age;
   Son(int fage, int sage)
   {  super(fage);
      age = sage;
   }
   void compute() throws WrongAge
   {
       if (age >= a)
          throw new WrongAge(age);
       else
       { SOP("The ages are correct");
         SOP("father age = " + a);
         SOP("sons age = " + age); }
? }
```



```
class main
{
    public static void main(String ss[])
    {
        Scanner sc = new Scanner(System.in);
        SOP("Enter ages of father & son");
        int f = sc.nextInt();
        int so = sc.nextInt();
        son obj = new son(f, so);
        try
        {
            obj.compute();
        }
        catch (WrongAge e)
        {
            SOP(e);
        }
    }
}
```

Execute Mode, Version, Inputs & Arguments

JDK 11.0.4

Result

compiled and executed in 6.463 sec(s)

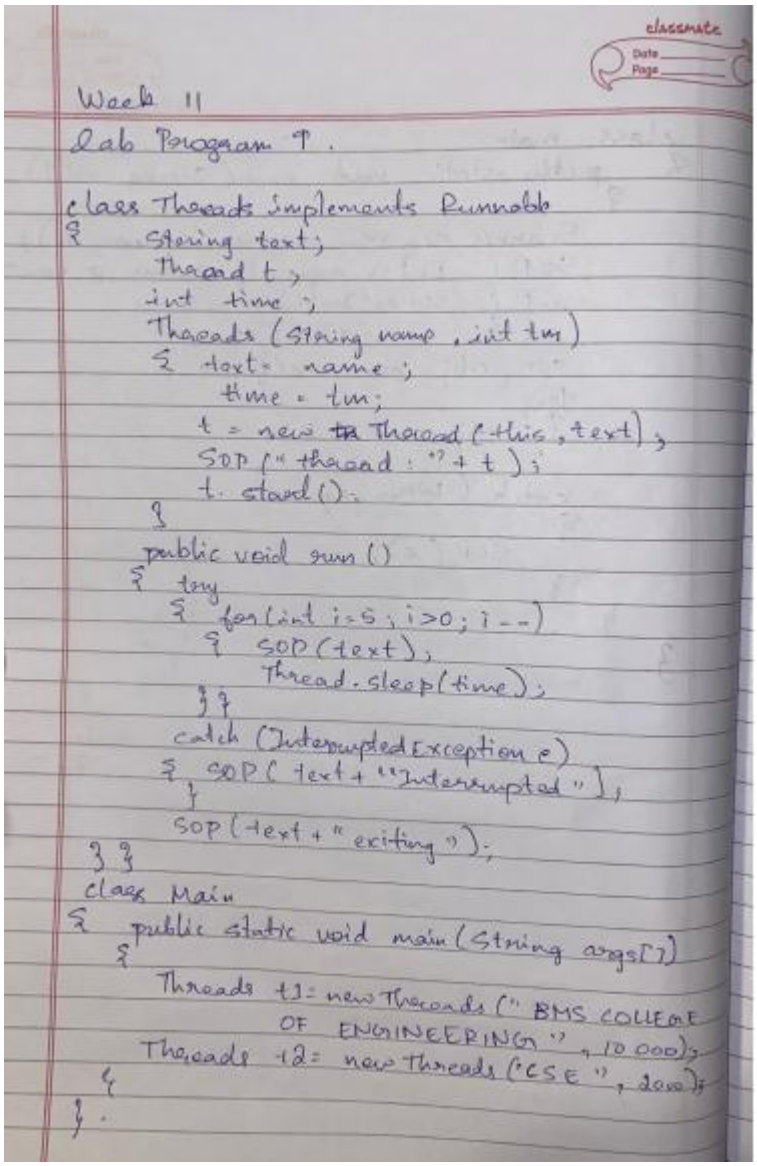
```
ENTER FATHER'S AGE
40
ENTER SON'S AGE
42
AGE OF SON=42 IS ENTERED INCORRECTLY
```

Lab Program 9:

```
class Threads implements Runnable {
   String text;
   Thread t;
   int time;
   Threads(String threadname,int tm) {
   text= threadname;
   time=tm;
   t = new Thread(this, text);
   System.out.println("thread:"+ t);
   t.start();
   }
   public void run() {
   try {
   for(int i = 5; i > 0; i--) {
   System.out.println(text);
   Thread.sleep(time);
   }
   } catch (InterruptedException e) {
   System.out.println(text + "Interrupted");
   }
   System.out.println(text + " exiting.");
   }
   }
   class Main {
   public static void main(String args[]) {
   Threads t1=new Threads("BMS COLLEGE OF ENGINEERING",10000);
   Threads t2=new Threads("CSE",2000);
```

}

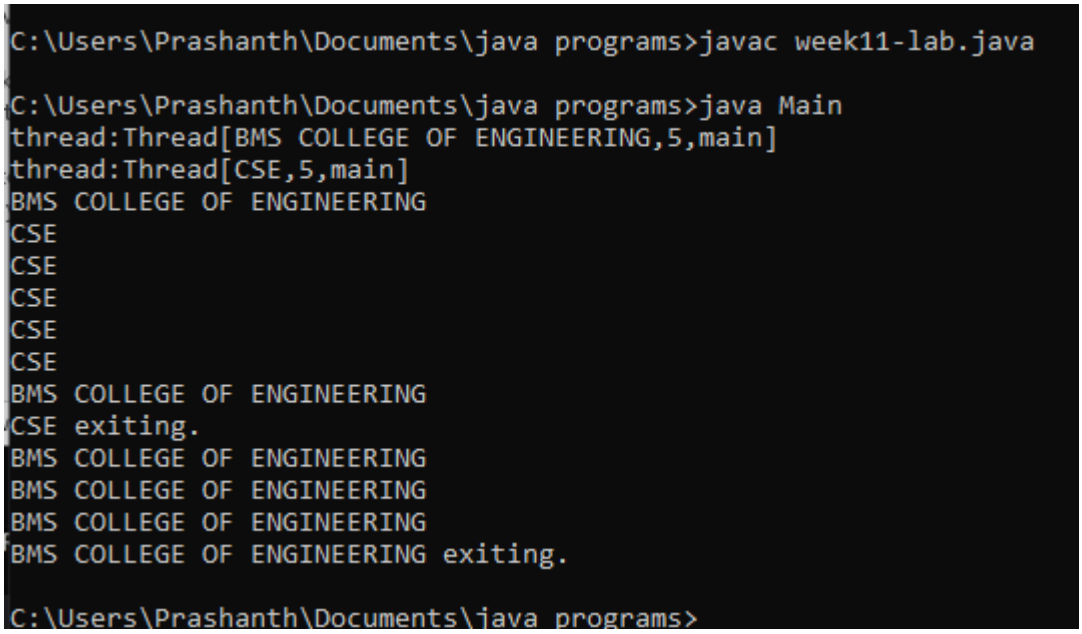
}



Week 11

Lab Program 7.

```
class Threads implements Runnable
{   String text;
    Thread t;
    int time;
    Threads (String name, int tm)
    {  text= name;
       time = tm;
       t = new Thread (this, text);
       SOP ("thread :" + t);
       t.start();
    }
    public void run()
    {  try
       {  for(int i=5; i>0; i--)
          {  SOP(text),
             Thread.sleep(time);
          }}
       catch (InterruptedException e)
       {  SOP( text + "Interrupted");
       }
       SOP(text + " exiting");
}}
class Main
{  public static void main(String args[])
   {
      Threads t1= new Threads ("BMS COLLEGE
                  OF ENGINEERING", 10000);
      Threads t2= new Threads ("CSE", 2000);
   }
}.
```



Lab Program 10:

/*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.*/

```
import java.awt.*;
import java.awt.event.*;
import javax.swing.*;
public class integerdivision extends Frame implements ActionListener
{
   TextField n1,n2,res;
   Label ln1,ln2,lres;
   Button b;
```

```
   public integerdivision()
           {
      setLayout(new FlowLayout());
      Label ln1=new Label("NUMBER 1",Label.RIGHT);
      Label ln2=new Label("NUMBER 2",Label.RIGHT);
      Label lres=new Label("RESULT",Label.RIGHT);
      n1=new TextField(12);
      n2=new TextField(8);
      res=new TextField(10);
      b=new Button("DIVISION");
      add(ln1);
      add(n1);
      add(ln2);
      add(n2);
      add(b);
      add(lres);
      add(res);
      b.addActionListener(this);
   addWindowListener(new WindowAdapter1());
}
public void actionPerformed(ActionEvent ae)
{
   if(ae.getSource()==b)
   {
      try{
      int num1=Integer.parseInt(n1.getText());
      int num2=Integer.parseInt(n2.getText());
      int num3=num1/num2;
      res.setText(String.valueOf(num3));
```

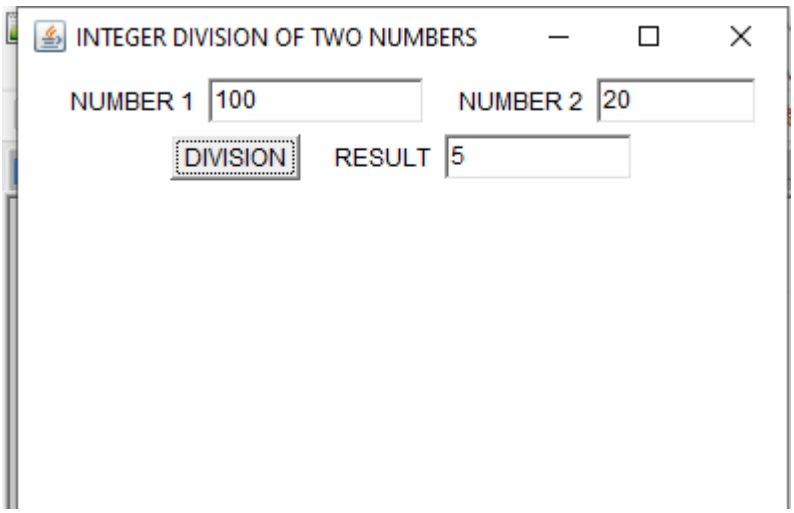
```
    }
            catch(NumberFormatException e )
            {
        JOptionPane.showMessageDialog(this,e,"ERROR", JOptionPane.ERROR_MESSAGE);
    }
    catch(ArithmeticException a)
            {
        JOptionPane.showMessageDialog(this,a,"DIVISION BY ZERO ERROR",
JOptionPane.ERROR_MESSAGE);
    }
}
}

public static void main(String args[])
{
    integerdivision i=new integerdivision();
    i.setSize(new Dimension(400,400));
    i.setTitle("INTEGER DIVISION OF TWO NUMBERSs");
    i.setVisible(true);
}

 class WindowAdapter1 extends WindowAdapter{
     public void windowClosing(WindowEvent we)
     {
         System.exit(0);
     }
 }
}
```

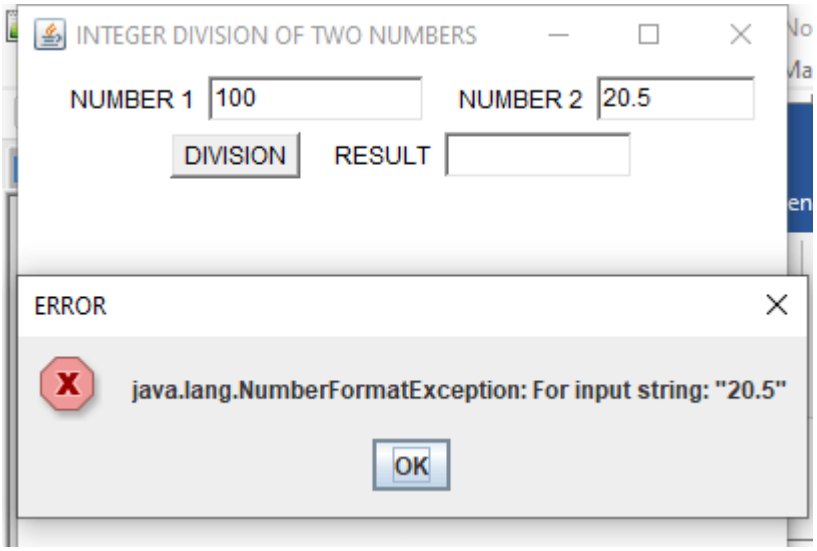
Week 13

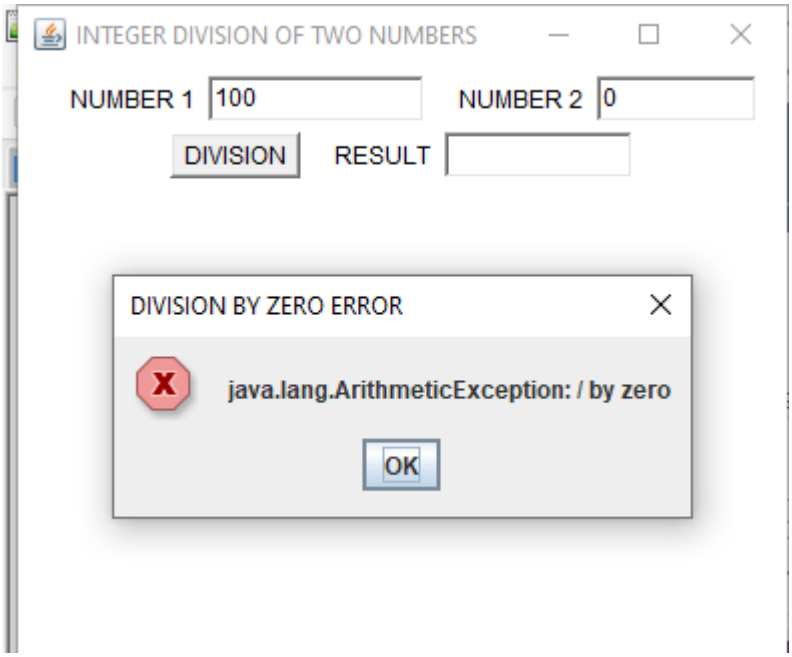
Lab Program 10.

```
import java.awt.*;
import java.awt.event.*;
import javax.swing.*;
public class integerdivision extends Frame
  implements ActionListener
{
   TextField n1, n2, res;
   Label ln1, ln2, lres;
   Button b;
   public integerdivision()
   {
      setLayout(new FlowLayout());
      Label ln1 = new Label("Number 1", Label.RIGHT);
      Label ln2 = new Label("Number 2", Label.RIGHT);
      Label lres = new Label("Result", Label.RIGHT);
      n1 = new TextField(12);
      n2 = new TextField(8);
      res = new TextField(10);
      b = new Button("Division");
      add(ln1);
      add(n1);
      add(ln2);
      add(n2);
      add(lres);
      add(res);
      b.addActionListener(this);
   addWindowListener(new WindowAdapter1());
}
```

```
public void actionPerformed(ActionEvent ae)
{
    if (ae.getSource() == b)
    {
        try {
        int num1 = Integer.parseInt(n1.getText());
        int num2 = Integer.parseInt(n2.getText());
        int num3 = num1 / num2 ;
        res.setText(String.valueOf(num3));
        }
    catch(NumberFormatException e)
    {
      JOptionPane.showMessageDialog(this, e, "ERROR",
          JOptionPane.ERROR_MESSAGE);
    }
    catch(ArithmeticException a)
    {
      JOptionPane.showMessageDialog(this, a, "ERROR",
          JOptionPane.ERROR_MESSAGE);
    }
  }
}

public static void main(String s[])
{ integerdivision i = new integerdivision();
  i.setSize(new Dimension(400,400));
  i.setTitle("Division");
  i.setVisible(true);
}}
class WindowAdapter extends WindowAdapter
{ public void windowClosing(WindowEvent we)
  {   System.exit(0);
  }
}
```




INTEGER DIVISION OF TWO NUMBERS
NUMBER 1
100
NUMBER 2
20.5
DIVISION
RESULT
ERROR
java.lang.NumberFormatException: For input string: "20.5"
OK


INTEGER DIVISION OF TWO NUMBERS
NUMBER 1
100
NUMBER 2
0
DIVISION
RESULT
DIVISION BY ZERO ERROR
java.lang.ArithmeticException: / by zero
OK