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RECORD:Test 2(Lab programs 1-10)

LAB 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.

OBSERVATION:

LAB 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.

ALGORITHM

- 1) START
- 2) READ a, b, c (co-efficients of the quadratic equation)
- 3) calculate $d = b^2 - 4ac$.
- 4) If ($d > 0$)
 - Calculate x_1 (root 1) = $\frac{(-b + \sqrt{d})}{2a}$
 - Calculate x_2 (root 2) = $\frac{(-b - \sqrt{d})}{2a}$
 - Display two real and different roots (x_1, x_2)
- 5) Else If ($d == 0$)
 - Calculate $(x_1)(root 1) = (root 2)(x_2) = \frac{-b}{2a}$
 - Display real and equal roots (x_1, x_2)
- 6) Else If ($d < 0$)
 - Display , no real solutions .
- 7) STOP

```

import java.util.*;
class lab1 {
    public static void main (String ss[]) {
        double r1, r2;
        Scanner s = new Scanner (System.in);
        System.out.println ("Enter the coefficients of the quadratic
equation");
        System.out.println ("Enter a");
        double a = s.nextDouble();
        System.out.println ("Enter b");
        double b = s.nextDouble();
        System.out.println ("Enter c");
        double c = s.nextDouble();
        double d = (b*b)-(4*a*c);
        if (d>0)
            {
                System.out.println ("Roots are real and different");
                r1 = (-b+Math.sqrt(d))/(2*a);
                r2 = (-b-Math.sqrt(d))/(2*a);
                System.out.println ("root 1 = " + r1 + " \n root 2 = " + r2);
            }
        else if (d==0)
            {
                System.out.println ("Roots are real and equal");
                r1 = r2 = -b/(2*a);
                System.out.println ("root1 = root2 = " + r1);
            }
        else
            {
                System.out.println ("No real solutions");
            }
    }
}

```

SOURCE CODE:

```
import java.util.*;
class lab1 {
    public static void main(String ss[]) {
        double r1,r2;
        Scanner s=new Scanner(System.in);
        System.out.println("Enter the coefficients of the quadratic equation");
        System.out.println("Enter a");
        double a = s.nextDouble();
        System.out.println("Enter b");
        double b = s.nextDouble();
        System.out.println("Enter c");
        double c = s.nextDouble();
        double d = (b*b)-(4*a*c);
        if(d>0)
        {
            System.out.println("Roots are real and different");
            r1 = (-b + Math.sqrt(d))/(2*a);
            r2 = (-b - Math.sqrt(d))/(2*a);
            System.out.println("root1 = "+r1+"\nroot2 = "+r2);
        }
        else if(d==0)
        {
            System.out.println("Roots are real and equal");
            r1=r2= -b/(2*a);
            System.out.println("root1 = root2 = "+r1);
        }
        else
        {
            System.out.println("No real solutions");
        }
    }
}
```

OUTPUT:

CASE 1:REAL AND DIFFERENT ROOTS

```
D:\Kusum\OOJ2020>java lab1
Enter the coefficients of the quadratic equation
Enter a
1
Enter b
-5
Enter c
6
Roots are real and different
root1 = 3.0
root2 = 2.0
```

CASE 2:REAL AND EQUAL ROOTS

```
D:\Kusum\OOJ2020>java lab1
Enter the coefficients of the quadratic equation
Enter a
1
Enter b
2
Enter c
1
Roots are real and equal
root1 = root2 = -1.0
```

CASE 3:NO REAL SOLUTIONS

```
D:\Kusum\OOJ2020>java lab1
Enter the coefficients of the quadratic equation
Enter a
1
Enter b
2
Enter c
3
No real solutions
```

Lab 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.

OBSERVATION:

LAB 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

ALGORITHM:

1. START
2. READ the members usn, name, credits, marks in the method accept().
3. DISPLAY the student details in the method display()
4. CALCULATE the SGPA of the student in the method calculate() using array of credits and marks
$$\text{SGPA} = \frac{\text{GradePoints}}{\text{Credits}}$$
5. In StudentMain class, the object is created and the default constructor of class Student is called.
6. The other methods of class Student is also called / invoked in the main class.
7. SGPA is DISPLAYED from the return value of calculate.
8. STOP

```
Code
import java.util.*;
class Student {
    private String usn;
    private String name;
    private int credits[];
    private int marks[];
    private int n;

    void accept() {
        Scanner s = new Scanner(System.in);
        System.out.println("Enter student details");
        System.out.println("USN:");
        usn = s.next();
        System.out.println("Name:");
        name = s.next();
        System.out.println("Enter the number of subjects:");
        n = s.nextInt();
        credits = new int[n];
        marks = new int[n];
        System.out.println("Enter credits and marks
attained by the student in each subject");
        for (int i=0; i<n; i++) {
            credits[i] = s.nextInt();
            marks[i] = s.nextInt();
        }
    }

    void display() {
        System.out.println("Student details:");
        System.out.println("USN: " + usn);
        System.out.println("Name: " + name);
        System.out.println("Marks in each subject:");
    }
}
```

```
for (int i = 0; i < n; i++)
{
    System.out.println ("Subject " + (i+1) + ":" + marks[i]);
}

double calculate()
{
    int tcp = 0, tc = 0;
    for (int i = 0; i < n; i++)
    {
        tc = tc + credits[i];
        if (marks[i] >= 50)
        {
            tcp = tcp + ((marks[i]/10) + 1) * credits[i];
        }
        else if (marks[i] >= 40 && marks[i] < 50)
        {
            tcp = tcp + (4 * credits[i]);
        }
    }
    return (double)tcp / tc;
}

class StudentMain
{
    public static void main (String ss[])
    {
        Student s1 = new Student();
        s1.accept();
        s1.display();
        System.out.println ("SGPA : " + s1.calculate());
    }
}
```

SOURCE CODE:

```
import java.util.*;
class Student {
    private String usn;
    private String name;
    private int credits[];
    private int marks[];
    private int n;

    void accept()
    {
        Scanner s=new Scanner(System.in);
        System.out.println("Enter student details");
        System.out.println("USN:");
        usn=s.next();
        System.out.println("Name:");
        name=s.next();
        System.out.println("Enter the number of subjects:");
        n=s.nextInt();
        credits=new int[n];
        marks=new int[n];
        System.out.println("Enter credits and marks attained by the student in each
subject");
        for(int i=0;i<n;i++)
        {
            credits[i]=s.nextInt();
            marks[i]=s.nextInt();
        }
    }
    void display()
    {
        System.out.println("Student details:");
        System.out.println("USN:"+usn);
        System.out.println("Name:"+name);
        System.out.println("Marks in each subject:");
        for(int i=0;i<n;i++)
        {
            System.out.println("Subject "+(i+1)+":"+marks[i]);
        }
    }
    double calculate()
    {
```

```
int tcp=0,tc=0;
for(int i=0;i<n;i++)
{
    tc=tc+credits[i];
    if(marks[i]>=50)
    {
        tcp=tcp+(((marks[i]/10)+1)*credits[i]);
    }
    else if(marks[i]>=40 && marks[i]<50)
    {
        tcp=tcp+(4*credits[i]);
    }
}
return (double)tcp/tc;
}

class StudentMain
{

public static void main(String ss[])
{
    Student s1=new Student();
    s1.accept();
    s1.display();
    System.out.println("SGPA: "+s1.calculate());
}
}
```

OUTPUT:

```
D:\Kusum\OOJ2020>java StudentMain
Enter student details
USN:
1BM19CS000
Name:
Palak
Enter the number of subjects:
5
Enter credits and marks attained by the student in each subject
4 77
5 78
3 74
4 75
4 77
Student details:
USN:1BM19CS000
Name:Palak
Marks in each subject:
Subject 1:77
Subject 2:78
Subject 3:74
Subject 4:75
Subject 5:77
SGPA: 8.0
```

```
D:\Kusum\OOJ2020>java StudentMain
Enter student details
USN:
1BM19EC000
Name:
Anusha
Enter the number of subjects:
5
Enter credits and marks attained by the student in each subject
4 91
5 88
3 99
4 94
4 93
Student details:
USN:1BM19EC000
Name:Anusha
Marks in each subject:
Subject 1:91
Subject 2:88
Subject 3:99
Subject 4:94
Subject 5:93
SGPA: 9.75
```

Lab 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.

OBSERVATION:

Week 5-Lab 3 Program

→ Java Program to create n book objects

```
import java.util.*;  
class Book {  
    String name;  
    String author;  
    int price;  
    int num-pages;
```

Book ()

{ }

Book (String name, String author, int price, int num-page)

{

this.name = name;

this.author = author;

this.price = price;

this.num-pages = num-pages;

}

void accept ()

{

Scanner s = new Scanner (System.in);

System.out.println ("Enter the name of the book");

name = s.next();

System.out.println ("Enter the author of the book");

author = s.next();

```

System.out.println("Enter the price of the book");
price = s.nextInt();
System.out.println("Enter the number of pages of the
book");
numPages = s.nextInt();
}

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

class BookMain
{
    public static void main(String ss[])
    {
        Scanner a = new Scanner(System.in);
        Book b1 = new Book("Heights", "Anne", 299, 345);
        System.out.println("Sample input: \n" + b1);
        System.out.println("Enter the number of books");
        int n = a.nextInt();
        Book b[] = new Book[n];
        for(int i=0; i<n; i++)
        {
            b[i] = new Book();
            System.out.println("Enter the details of " + (i+1) + " book");
            b[i].accept();
        }
        for(int i=0; i<n; i++)
        {
            System.out.println("Details of book " + (i+1));
            System.out.println(b[i]);
        }
    }
}

```

SOURCE CODE:

```
import java.util.*;
class Book {
    String name;
    String author;
    int price;
    int num_pages;
    Book()
    {}
    Book(String name, String author, int price, int num_pages)
    {
        this.name=name;
        this.author=author;
        this.price=price;
        this.num_pages=num_pages;
    }
    void accept()
    {
        Scanner s=new Scanner(System.in);
        System.out.println("Enter the name of the book");
        name=s.next();
        System.out.println("Enter the author of the book");
        author=s.next();
        System.out.println("Enter the price of the book");
        price=s.nextInt();
        System.out.println("Enter the number of pages of the book");
        num_pages=s.nextInt();
    }
    public String toString()
    {
        return ("Name: "+name + "\n" + "Author: "+author + "\n" + "Price: "+price +
"\n" +"Number of pages: "+num_pages );
    }
}
class BookMain {
    public static void main(String ss[])
    {
        Scanner a=new Scanner(System.in);
        Book b1=new Book("Heights", "Anne", 299, 345);
        System.out.println("Sample input:\n"+b1);
        System.out.println("Enter the number of books");
        int n=a.nextInt();
        Book b[]=new Book[n];
```

```

        for(int i=0;i<n;i++)
        {
            b[i]=new Book();
            System.out.println("Enter the details of "+(i+1)+" book");
            b[i].accept();
        }
        for(int i=0;i<n;i++)
        {
            System.out.println("Details of book "+(i+1));
            System.out.println(b[i]);
        }
    }
}

```

OUTPUT:

```

D:\Kusum\III SEMESTER\OOJ2020>java BookMain
Sample input:
Name: Heights
Author: Anne
Price: 299
Number of pages: 345
Enter the number of books
3
Enter the details of 1 book
Enter the name of the book
Rise
Enter the author of the book
William
Enter the price of the book
300
Enter the number of pages of the book
455
Enter the details of 2 book
Enter the name of the book
Star
Enter the author of the book
John
Enter the price of the book
299
Enter the number of pages of the book
588
Enter the details of 3 book
Enter the name of the book
Oceans
Enter the author of the book
Joe
Enter the price of the book
245
Enter the number of pages of the book
366

```

Details of book 1
Name: Rise
Author: William
Price: 300
Number of pages: 455
Details of book 2
Name: Star
Author: John
Price: 299
Number of pages: 588
Details of book 3
Name: Oceans
Author: Joe
Price: 245
Number of pages: 366

LAB 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.

OBSERVATION:

Lab 4 Week 5

```
import java.util.*;
abstract class Shape
{
    int a, b;
    abstract void printArea();
}

class Rectangle extends Shape
{
    void printArea()
    {
        Scanner ss = new Scanner(System.in);
        System.out.println("Enter length and breadth of the rectangle");
        a = ss.nextInt();
        b = ss.nextInt();
        double area;
        area = (double)a * b;
        System.out.println("The area of Rectangle is "+area);
    }
}

class Triangle extends Shape
{
    void printArea()
    {
        Scanner ss = new Scanner(System.in);
        System.out.println("Enter the base length and height of the triangle");
        a = ss.nextInt();
        b = ss.nextInt();
        double area;
        area = (double)0.5*a*b;
        System.out.println("The area of Triangle is "+area);
    }
}
```

```
class Circle extends Shape
```

```
{ void printArea()
```

```
{ Scanner ss = new Scanner (System.in);  
System.out.println ("Enter the radius of the circle");  
a = ss.nextInt();  
double area;  
area = (double) 3.14 * a * a;  
System.out.println ("The area of circle is "+area);  
}
```

```
}
```

```
class ShapeMain
```

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

```
{ int ch;  
Scanner ss = new Scanner (System.in);  
Rectangle r = new Rectangle();  
Triangle t = new Triangle();  
Circle c = new Circle();
```

```
while (true) {
```

```
System.out.println ("Enter the choice of shape whose  
area has to be calculated");  
System.out.println ("1.Rectangle\n2.Triangle\n3.Circle\n4.Exit");
```

```
ch = ss.nextInt();
```

```
switch (ch)
```

```
{ case 1: r.printArea();
```

```
break;
```

```
case 2: t.printArea();
```

```
break;
```

```
case 3: c.printArea();
```

```
break;
```

```
case 4: System.exit (0);
```

```
break;
```

```
default: System.out.println ("Invalid choice!");  
}
```

SOURCE CODE:

```
import java.util.*;
abstract class Shape
{
int a,b;
abstract void printArea();
}

class Rectangle extends Shape
{
void printArea()
{
Scanner ss=new Scanner(System.in);
System.out.println("Enter length and breadth of the rectangle");
a=ss.nextInt();
b=ss.nextInt();
double area;
area=(double)a*b;
System.out.println("The area of Rectangle is "+area);
}
}

class Triangle extends Shape
{
void printArea()
{
Scanner ss=new Scanner(System.in);
System.out.println("Enter base length and height of the triangle");
a=ss.nextInt();
b=ss.nextInt();
double area;
area=(double)0.5*a*b;
System.out.println("The area of Triangle is "+area);
}
}

class Circle extends Shape
{
void printArea()
{
Scanner ss=new Scanner(System.in);
System.out.println("Enter radius of the circle");
a=ss.nextInt();
double area;
area=(double)3.14*a*a;
System.out.println("The area of Circle is "+area);
}
```

```
}

}

class Shapemain
{
public static void main(String args[])
{
int ch;
Scanner ss=new Scanner(System.in);
Rectangle r=new Rectangle();
Triangle t=new Triangle();
Circle c=new Circle();
while(true){
System.out.println("Enter the choice of shape whose area has to be calculated");
System.out.println("1.Rectangle\n2.Triangle\n3.Circle\n4.Exit");
ch=ss.nextInt();
switch(ch)
{
case 1:
r.printArea();
break;
case 2:
t.printArea();
break;
case 3:
c.printArea();
break;
case 4:
System.exit(0);
break;
default:
System.out.println("Invalid choice!");
}
}
}
```

OUTPUT:

```
D:\Kusum\III SEMESTER\OOJ2020>javac lab4.java

D:\Kusum\III SEMESTER\OOJ2020>java Shapemain
Enter the choice of shape whose area has to be calculated
1.Rectangle
2.Triangle
3.Circle
4.Exit
1
Enter length and breadth of the rectangle
2
3
The area of Rectangle is 6.0
Enter the choice of shape whose area has to be calculated
1.Rectangle
2.Triangle
3.Circle
4.Exit
2
Enter base length and height of the triangle
1
2
The area of Triangle is 1.0
Enter the choice of shape whose area has to be calculated
1.Rectangle
2.Triangle
3.Circle
4.Exit
3
Enter radius of the circle
2
The area of Circle is 12.56
Enter the choice of shape whose area has to be calculated
1.Rectangle
2.Triangle
3.Circle
4.Exit
5
Invalid choice!

Enter the choice of shape whose area has to be calculated
1.Rectangle
2.Triangle
3.Circle
4.Exit
4

D:\Kusum\III SEMESTER\OOJ2020>
```

LAB 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

OBSERVATION:

```

Lab 5:
import java.util.Scanner;
abstract class Account {
    String cName, accType;
    long accNo;
    double bal;
    final double minBal = 1000.0;
    Account (String cName, long accNo, double bal, String accType) {
        this.accNo = accNo;
        this.cName = cName;
        this.bal = bal;
        this.accType = accType;
    }
    abstract void addBal (double amt);
    abstract void dispBal ();
    abstract void withdraw (double amt);
}

class Curr_acct extends Account {
    Curr_acct (String cName, long accNo, double bal) {
        super(cName, accNo, bal, "Current");
        System.out.println("Name : " + cName + "\t accNo : " +
                           accNo + "\t bal : " + bal + "\t type : " + accType);
    }
    void addBal (double amt) {
        this.bal += amt;
    }
    void dispBal () {
        System.out.println("Your balance is : " + this.bal);
    }
    void checkBal () {
        if (this.bal < minBal) {
            System.out.println("Insufficient balance, penalty
                               imposed");
            this.bal -= this.bal * 0.02;
        }
    }
}

```

```
void withdraw (double amt) {
    this . bal -= amt;
    checkBal();
}
}

class Sav-acct extends Account {
    Sav-acct (String cName, long accNo, double bal) {
        super (cName, accNo, bal, "Savings");
        System.out.println ("Name : " + cName + " | accNo : " + accNo +
                            " | bal : " + bal + " | type : " + accType);
    }
    void addBal (double amt) {
        this . bal += amt;
        addIntr();
    }
    void addIntr () {
        this . bal += this . bal * 0.07;
    }
    void display () {
        System.out.println ("Your balance is : " + this . bal);
    }
    void withdraw (double amt) {
        this . bal -= amt;
    }
}

class Bank {
    public static void main (String [ ] args) {
        Scanner sc = new Scanner (System.in);
        Double amt;
        System.out.println ("Enter your details : ");
        System.out.println ("Name : ");
        String x = sc.next();
    }
}
```

```

System.out.println("Account Number : ");
long y = sc.nextInt();
for(;;)
{
    System.out.println("Type of account :\n1. Current account\n2. Savings account\n3. Exit");
    int t = sc.nextInt();
    if(t==1)
    {
        System.out.println("The current account provides\ncheque book facility but no interest.");
        Curr_acct c = new Curr_acct(x,y,50000);
        for(;;)
        {
            System.out.println("1: Deposit\n2: Display Balance\n3: Withdraw\n4: Exit");
            int ch = sc.nextInt();
            switch(ch)
            {
                case 1:
                    System.out.println("Enter the amount to be added.");
                    amt = sc.nextDouble();
                    c.addBal(amt);
                    break;
                case 2:
                    c.dispBal();
                    break;
                case 3:
                    System.out.println("Enter the amount to be withdrawn:");
                    amt = sc.nextDouble();
                    c.withBal(amt);
                    break;
                case 4:
                    System.exit(0);
                default:
                    System.out.println("Invalid choice! Try again!");
            }
        }
    }
}

```

```
else if (t == 2) {  
    System.out.println("The savings account provides compound  
interest and withdrawal facilities but no checkbook  
facility");
```

```
Sav-act s = new Sav-act(x, y, 5000);
```

```
for (;;) {
```

```
    System.out.println("1: Deposit\n2: Display Balance\n3:
```

```
    Withdraw\n4: exit");
```

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

```
    switch (ch) {
```

```
        case 1:
```

```
            System.out.println("Enter the amount to be added:");
```

```
            amt = sc.nextDouble();
```

```
s.addBal(amt);
```

```
            break;
```

```
        case 2:
```

```
s.dispBal();
```

```
            break;
```

```
        case 3:
```

```
            System.out.println("Enter the amount to be withdrawn:");
```

```
            amt = sc.nextDouble();
```

```
s.withBal(amt);
```

```
            break;
```

```
        case 4: System.exit(0);
```

```
        default: System.out.println("Invalid choice! Try again");
```

```
}
```

```
}
```

```
else if (t == 3)
```

```
    System.exit(0);
```

```
else
```

```
    System.out.println("Invalid choice! Try again");
```

```
}
```

```
}
```

```
}
```

SOURCE CODE:

```
import java.util.Scanner;

abstract class Account {
    String cName, accType;
    long accNo;
    double bal;
    final double minBal = 1000.0;

    Account(String cName, long accNo, double bal, String accType) {
        this.accNo = accNo;
        this.cName = cName;
        this.bal = bal;
        this.accType = accType;
    }

    abstract void addBal(double amt);

    abstract void dispBal();

    abstract void withBal(double amt);
}

class Curr_acct extends Account {
    Curr_acct(String cName, long accNo, double bal) {
        super(cName, accNo, bal, "Current");
        System.out.println("Name: "+cName+"\taccno: "+accNo+"\tbal: "+bal+"\ttype: "+accType);
    }

    void addBal(double amt){
        this.bal += amt;
    }

    void dispBal(){
        System.out.println("Your balance is: " + this.bal);
    }

    void checkBal() {
        if (this.bal < minBal) {
            System.out.println("Insufficient balance, penalty imposed");
            this.bal -= this.bal * 0.02;
        }
    }
}
```

```

}

void withBal(double amt){
    this.bal -= amt;
    checkBal();
}

}

class Sav_acct extends Account {
    Sav_acct(String cName, long accNo, double bal) {
        super(cName, accNo, bal, "Savings");
        System.out.println("name: " + cName + "\taccno: " + accNo + "\tbl: " + bal + "\tttype: " +
accType);
    }

    void addBal(double amt){
        this.bal += amt;
        addIntr();
    }

    void addIntr() {
        this.bal += this.bal * 0.07;
    }

    void dispBal(){
        System.out.println("Your balance is: " + this.bal);
    }

    void withBal(double amt){
        this.bal -= amt;
    }
}

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

```

```

System.out.println("Enter your details:");
System.out.println("Name:");
String x=sc.next();
System.out.println("Account Number:");
long y=sc.nextLong();
for(;;)
{
    System.out.println("Type of account:\n1.Current account\n2.Savings
account\n3.Exit");
    int t=sc.nextInt();

    if(t==1){
        System.out.println("The current account provides cheque book facility but
no interest.");
        Curr_acct c = new Curr_acct(x, y, 50000);
        for(;;)
        {
            System.out.println("1:Deposit\n2:Display Balance\n3:Withdraw\n4:Exit");
            int ch = sc.nextInt();

            switch (ch) {
                case 1:
                    System.out.println("Enter the amount to be added:");
                    amt = sc.nextDouble();
                    c.addBal(amt);
                    break;

                case 2:
                    c.dispBal();
                    break;

                case 3:
                    System.out.println("Enter the amount to be withdrawn:");
                    amt = sc.nextDouble();
                    c.withBal(amt);
                    break;
                case 4:System.exit(0);
                default:System.out.println("Invalid choice! Try again");
            }
        }
    }
}

```


OUTPUT:

CASE 1:Current Account(With deposit, display, withdraw, Penalty, Exit)

```
D:\Kusum\III SEMESTER\OOJ2020>javac lab5.java

D:\Kusum\III SEMESTER\OOJ2020>java Bank
Enter your details:
Name:
Kusum
Account Number:
38216481
Type of account:
1.Current account
2.Savings account
3.Exit
1
The current account provides cheque book facility but no interest.
Name: Kusum      accno: 38216481 bal: 50000.0      type: Current
1:Deposit
2:Display Balance
3:Withdraw
4:Exit
1
Enter the amount to be added:
200
1:Deposit
2:Display Balance
3:Withdraw
4:Exit
2
Your balance is: 50200.0
1:Deposit
2:Display Balance
3:Withdraw
4:Exit
3
Enter the amount to be withdrawn:
500
```

```
1:Deposit
2:Display Balance
3:Withdraw
4:Exit
3
Enter the amount to be withdrawn:
49000
Insufficient balance, penalty imposed
1:Deposit
2:Display Balance
3:Withdraw
4:Exit
2
Your balance is: 686.0
1:Deposit
2:Display Balance
3:Withdraw
4:Exit
5
Invalid choice! Try again
1:Deposit
2:Display Balance
3:Withdraw
4:Exit
4

D:\Kusum\III SEMESTER\OOJ2020>
```

CASE 2:Savings account(Deposit,Compound interest,Display,withdraw,Invalid choice,Exit)

```
D:\Kusum\III SEMESTER\OOJ2020>javac lab5.java
D:\Kusum\III SEMESTER\OOJ2020>java Bank
Enter your details:
Name:
Kusum
Account Number:
12487183
Type of account:
1.Current account
2.Savings account
3.Exit
2
The savings account provides compound interest and withdrawal facilities but no cheque book facility.
name: Kusum      accno: 12487183 bal: 5000.0      type: Savings
1:Deposit
2:Display Balance
3:Withdraw
4:Exit
1
Enter the amount to be added:
300
1:Deposit
2:Display Balance
3:Withdraw
4:Exit
2
Your balance is: 5671.0
1:Deposit
2:Display Balance
3:Withdraw
4:Exit
3
Enter the amount to be withdrawn:
500
1:Deposit
2:Display Balance
3:Withdraw
4:Exit
2
Your balance is: 5171.0
1:Deposit
2:Display Balance
3:Withdraw
4:Exit
7
Invalid choice! Try again
1:Deposit
2:Display Balance
3:Withdraw
4:Exit
4
D:\Kusum\III SEMESTER\OOJ2020>
```

Case 3:Invalid choice and exit

```
D:\Kusum\III SEMESTER\OOJ2020>javac lab5.java

D:\Kusum\III SEMESTER\OOJ2020>java Bank
Enter your details:
Name:
Kusum
Account Number:
491493257
Type of account:
1.Current account
2.Savings account
3.Exit
6
Invalid choice! Try again
Type of account:
1.Current account
2.Savings account
3.Exit
3

D:\Kusum\III SEMESTER\OOJ2020>
```

LAB 6:

Solve this program and write the procedure you have used to execute this in your observation. 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.

OBSERVATION:

* Week 9 Lab Program 6 ~~with structure~~
* Below is two programs of class Student and class
Internals, both belong to package
Student.java class Internals named CIE
class Internals is a subclass of
class Student

```
package CIE;
import java.util.Scanner;
public class Student
{
    public String name;
    public String usn;
    public int sem;
    public void display()
    {
        Scanner s = new Scanner(System.in);
        System.out.println("Name : ");
        name = s.next();
        System.out.println("USN : ");
        usn = s.next();
        System.out.println("Semester : ");
        sem = s.nextInt();
    }
}
```

Internals.java

```
package CIE;
import java.util.Scanner;
public class Internals extends Student
{
    public double ciem[];
    public void display()
    {
        ciem = new double[5];
        Scanner t = new Scanner(System.in);
        System.out.println("CIE Marks for 5 subjects (out of 50)");
        for(int i=0; i<5; i++)
            ciem[i] = t.nextDouble();
    }
}
```

* Class Externals belongs to package SEE and is derived from class Student of package CIE

```
package SEE;
import java.util.*;
import CIE.*;
public class Externals extends CIE.Student
{
    public double seem[];
    public void display()
    {
        seem = new double[5];
        Scanner s = new Scanner(System.in);
        System.out.println("SEE marks for 5 subjects
                           (out of 100):");
        for (int i=0; i<5; i++)
            seem[i] = s.nextDouble();
    }
}
```

* Below is driver class main which imports both the packages CIE and SEE

```
import CIE.*;
import SEE.*;
import java.util.Scanner;
public class Atm
{
    public static void main (String args[])
    {
        int n;
        Scanner s = new Scanner(System.in);
        System.out.println ("Enter the number of students:");
        n = s.nextInt();
        CIE.Student st[] = new CIE.Student[n];
        CIE.Externals eI[] = new CIE.Externals[n];
        SEE.Externals eE[] = new SEE.Externals[n];
        for (int i=0; i<n; i++)
        {
            st[i] = new CIE.Student();
            eI[i] = new CIE.Externals();
            eE[i] = new SEE.Externals();
        }
    }
}
```

```
in[i] = new CIE::Internals();
e[i] = new SEE::Externals();
st[i].display();
in[i].display();
e[i].display();
System.out.println("Total marks of student "+  
st[i].name+" in 5 subjects are : ");
st[i].name+" in 5 subjects are : ";
for (int j=0; j<5; j++)
    System.out.println(in[i].clem[j] + (e[i].seem[j]/2));
}
}
```

3
3

SOURCE CODE:**student.java**

```
package CIE;
import java.util.Scanner;
public class Student
{
    public String name;
    public String usn;
    public int sem;
    public void display()
    {
        Scanner s=new Scanner(System.in);
        System.out.println("Name:");
        name=s.next();
        System.out.println("USN:");
        usn=s.next();
        System.out.println("Semester:");
        sem=s.nextInt();
    }
}
```

Internals.java

```
package CIE;
import java.util.Scanner;
public class Internals extends Student
{
    public double ciem[];
    public void display()
    {
        ciem=new double[5];
        Scanner t=new Scanner(System.in);
        System.out.println("CIE Marks for 5 subjects(out of 50):");
        for(int i=0;i<5;i++)
            ciem[i]=t.nextDouble();
    }
}
```

Externals.java

```
package SEE;
import java.util.*;
import CIE.*;
public class Externals extends CIE.Student
{
    public double seem[];
    public void display()
    {
```

```

seem=new double[5];
Scanner s=new Scanner(System.in);
System.out.println("SEE Marks for 5 subjects(out of 100):");
for(int i=0;i<5;i++)
seem[i]=s.nextDouble();
}
}

main.java
import CIE.*;
import SEE.*;
import java.util.Scanner;
public class main
{
public static void main(String args[])
{
int n;
Scanner s=new Scanner(System.in);
System.out.println("Enter the number of students:");
n=s.nextInt();
CIE.Student st[]=new CIE.Student[n];
CIE.Internals in[]=new CIE.Internals[n];
SEE.Externals e[]=new SEE.Externals[n];
for(int i=0;i<n;i++)
{
st[i]=new CIE.Student();
in[i]=new CIE.Internals();
e[i]=new SEE.Externals();
st[i].display();
in[i].display();
e[i].display();
System.out.println("Total marks of student "+st[i].name+" in 5
subjects are:");
for(int j=0;j<5;j++)
{
System.out.println(in[i].ciem[j]+(e[i].seem[j]/2));
}
}
}
}

```

OUTPUT:

```
D:\Kusum\III SEMESTER\OOJ2020\packages>javac student.java  
D:\Kusum\III SEMESTER\OOJ2020\packages>javac Internals.java  
D:\Kusum\III SEMESTER\OOJ2020\packages>javac Externals.java  
D:\Kusum\III SEMESTER\OOJ2020\packages>javac main.java  
D:\Kusum\III SEMESTER\OOJ2020\packages>java main
```

```
Enter the number of students:  
2  
Name:  
Helly  
USN:  
1BM19CS001  
Semester:  
3  
CIE Marks for 5 subjects(out of 50):  
34  
45  
47  
38  
39  
SEE Marks for 5 subjects:  
89  
98  
78  
79  
96  
Total marks of student Helly in 5 subjects are:  
78.5  
94.0  
86.0  
77.5  
87.0
```

```
Name:  
Suman  
USN:  
1BM18CS010  
Semester:  
5  
CIE Marks for 5 subjects(out of 50):  
35  
49  
50  
39  
48  
SEE Marks for 5 subjects:  
82  
95  
88  
69  
100  
Total marks of student Suman in 5 subjects are:  
76.0  
96.5  
94.0  
73.5  
98.0
```

```
D:\Kusum\III SEMESTER\OOJ2020\packages>
```

LAB 7:

Write a program to demonstrate generics with multiple object parameters.

OBSERVATION:

Name : KUSUM M R
USN : IBM19CS077

24/11/2020

Lab 7: Program to demonstrate generics with multiple object parameters

```
import java.util.*;  
class Gener<T,U,V>  
{  
    T usn;  
    U attendance;  
    V cgpa;  
    Gener(T n, U a, V c)  
    {  
        usn = n;  
        attendance = a;  
        cgpa = c;  
    }  
    void display()  
    {  
        System.out.println("=====");  
        System.out.println("USN of student: "+usn);  
        System.out.println("Attendance= "+attendance);  
        System.out.println("CGPA= "+cgpa);  
    }  
}
```

```

class GenDemo
{
    public static void main (String args[])
    {
        Scanner in = new Scanner (System.in);
        String USN;
        int attd;
        double cg;
        System.out.println ("Enter the USN of the student:");
        USN = in.next();
        System.out.println ("Enter the attendance % of the
                           student:");
        attd = in.nextInt();
        System.out.println ("Enter the CGPA of the student:");
        cg = in.nextDouble();
        Gener<String, Integer, Double> ob = new Gener<String,
                                         Integer, Double>(USN, attd, cg);
        ob.display();
    }
}

```

SOURCE CODE:

```

import java.util.*;
class Gener<T,U,V>
{
    T usn;
    U attendance;
    V cgpa;
    Gener(T n,U a,V c)
    {
        usn = n;
        attendance = a;
        cgpa = c;
    }
    void display()
    {
        System.out.println("=====");
        System.out.println("USN of student: "+usn);
        System.out.println("Attendance = "+attendance);
        System.out.println("CGPA = "+cgpa);
    }
}

```

```
}

class GenDemo
{
    public static void main(String args[])
    {
        Scanner in = new Scanner(System.in);
        String USN;
        int attd;
        double cg;
        System.out.println("Enter the USN of the student:");
        USN = in.next();
        System.out.println("Enter the attendance % of the student:");
        attd = in.nextInt();
        System.out.println("Enter the CGPA of the student:");
        cg = in.nextDouble();
        Gener<String, Integer, Double> ob = new Gener<String, Integer, Double>(USN,
attd, cg);
        ob.display();
    }
}
```

OUTPUT:

```
D:\Kusum\III SEMESTER\OOJ2020>javac lab7.java

D:\Kusum\III SEMESTER\OOJ2020>java GenDemo
Enter the USN of the student:
1BM19
Enter the attendance % of the student:
88
Enter the CGPA of the student:
9.8
=====
USN of student: 1BM19
Attendance = 88
CGPA = 9.8
```

LAB 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<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.

OBSERVATION:

Name : KUSUM · M · R

U.S.N : IBM19CS077

Date : 24/11/2020

Lab-8

Demonstrate handling of exceptions in inheritance tree

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

```

class Father {
    int a;
    Father(int x) {
        a = x;
    }
    void check() throws WrongAge {
        if (a < 0) {
            throw new WrongAge(a);
        }
    }
}

class Son extends Father {
    int age;
    Son(int fage, int sage) {
        super(fage);
        age = sage;
    }
    void compute() throws WrongAgeSon {
        if (age >= a) {
            throw new WrongAgeSon(age);
        } else {
            System.out.println("THE AGES ARE ENTERED CORRECTLY");
            System.out.println("FATHER'S AGE = " + a + " & SON'S AGE = " + age);
        }
    }
}

class ExceptionsMain {
    public static void main(String args[]) {
        Scanner s = new Scanner(System.in);
        System.out.print("ENTER FATHER'S AGE:");
        int f = s.nextInt();
        System.out.print("ENTER SON'S AGE:");
        int so = s.nextInt();
        Son ss = new Son(f, so);
        try {
            ss.check();
        }
    }
}

```

```
try {
    ss. compute ();
}
catch (WrongAgeSon e) {
    System.out.println (e);
}
catch (WrongAge e) {
    System.out.println (e);
}
}
```

SOURCE CODE:

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

```
}

void check() throws WrongAge {
if (a<0) {
throw new WrongAge(a);
}
}

class Son extends Father {
int age;
Son(int fage,int sage) {
super(fage);
age = sage;
}
void compute() throws WrongAgeSon {
if (age >= a) {
throw new WrongAgeSon(age);
} else {
System.out.println("THE AGES ARE ENTERED CORECTLY");
System.out.println("FATHER'S AGE=" + a + "\t" + "SON'S AGE=" + age);
}
}
}

class ExceptionsMain {
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.check();
try {
ss.compute();
} catch (WrongAgeSon e) {
System.out.println(e);
}
} catch (WrongAge e) {
System.out.println(e);
}
}
}
```

OUTPUT:

```
D:\Kusum\III SEMESTER\OOJ2020>javac lab8mod.java  
D:\Kusum\III SEMESTER\OOJ2020>java ExceptionsMain  
ENTER FATHER'S AGE:  
40  
ENTER SON'S AGE:  
20  
THE AGES ARE ENTERED CORECTLY  
FATHER'S AGE=40 SON'S AGE=20  
  
D:\Kusum\III SEMESTER\OOJ2020>java ExceptionsMain  
ENTER FATHER'S AGE:  
-10  
ENTER SON'S AGE:  
20  
AGE OF FATHER=-10 IS ENTERED INCORRECTLY  
  
D:\Kusum\III SEMESTER\OOJ2020>java ExceptionsMain  
ENTER FATHER'S AGE:  
10  
ENTER SON'S AGE:  
20  
AGE OF SON=20 IS ENTERED INCORRECTLY
```

LAB 9:

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

OBSERVATION:

Name: KUSUM·M·R
USN: 1BM19CS077

Date: 08/12/2020

Week 11
Lab Program 9:

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

```
import java.util.*;
class NewThread implements Runnable
{
    Thread t;
    String name;
    int time;
    NewThread (String nm, int tm)
    {
        name = nm;
        time = tm;
        t = new Thread (this, nm);
    }
    public void run()
    {
        try
        {
            for (int n=20; n>0; n--)
            {
                System.out.println (name);
                Thread.sleep (time);
            }
        }
        catch (InterruptedException ie)
        {
            System.out.println ("Thread Interrupted");
        }
    }
}
```

```
class Week11Lab
{
    public static void main(String ss[])
    {
        NewThread bmsce = new NewThread ("BMS College of
Engineering", 10000);
        NewThread cse = new NewThread ("CSE", 2000);
        bmsce.t.start();
        cse.t.start();
    }
}
```

SOURCE CODE:

```
class NewThread implements Runnable
{
    Thread t;
    String name;
    int time;
    NewThread(String nm,int tm)
    {
        name = nm;
        time = tm;
        t=new Thread(this, nm);
    }
    public void run()
    {
        try
        {
            for(int n=20;n>0;n--)
            {
                System.out.println(name);
                Thread.sleep(time);
            }
        }
        catch(InterruptedException ie)
        {
            System.out.println("Thread Interrupted");
        }
    }
}

class Week11Lab
{
    public static void main(String ss[])
    {
        NewThread bmsce=new NewThread("BMS College of Engineering",10000);
        NewThread cse=new NewThread("CSE",2000);
        bmsce.t.start();
        cse.t.start();
    }
}
```

OUTPUT: Loop 20 times for both the threads(one every 2 seconds,another every 10 seconds)

```
D:\Kusum\III SEMESTER\OOJ2020>javac lab9.java
```

```
D:\Kusum\III SEMESTER\OOJ2020>java Week11Lab
```

```
BMS College of Engineering
```

```
CSE
```

```
BMS College of Engineering
```

```
CSE
```

```
BMS College of Engineering
```

```
CSE
```

```
BMS College of Engineering
```

```
CSE
```

```
BMS College of Engineering
```

```
D:\Kusum\III SEMESTER\OOJ2020>
```

LAB 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.

OBSERVATION:

Name : KUSUM M.R
USN : 1BM19CS077

Date : 15/12/2020

Week 12

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 ArithmeticException. Display the exception in a message dialog box.

```
import java.awt.*;
import java.awt.event.*;
import java.swing.*;
class integerdivision extends Frame implements ActionListener{
    TextField n1,n2,res;
    Label ln1,ln2,lnres;
    Button b;
    public integerdivision(){
        setLayout(new FlowLayout());
        Label ln1 = new Label("NUMBER 1",Label.RIGHT);
```

```

Label lnum2 = 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 ("DIVIDE");
add(lnum1);
add(n1);
add(lnum2);
add(n2);
add(b);
add(lres);
add(res);
b.addActionListener(this);
addWindowListener(new WindowAdapter());
}

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 ne) {
            JOptionPane.showMessageDialog(this, ne, "ERROR",
                JOptionPane.ERROR_MESSAGE);
        }
        catch (ArithmeticException a) {
            JOptionPane.showMessageDialog(this, a, "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 NUMBERS");
    i.setVisible(true);

}

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

SOURCE CODE:

```
import java.awt.*;
import java.awt.event.*;
import javax.swing.*;
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("DIVIDE");
        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 ne ){
                JOptionPane.showMessageDialog(this,ne,"ERROR", JOptionPane.ERROR_MESSAGE);
            }
            catch(ArithmaticException a){
                JOptionPane.showMessageDialog(this,a,"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 NUMBERS");
    i.setVisible(true);
}

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

```

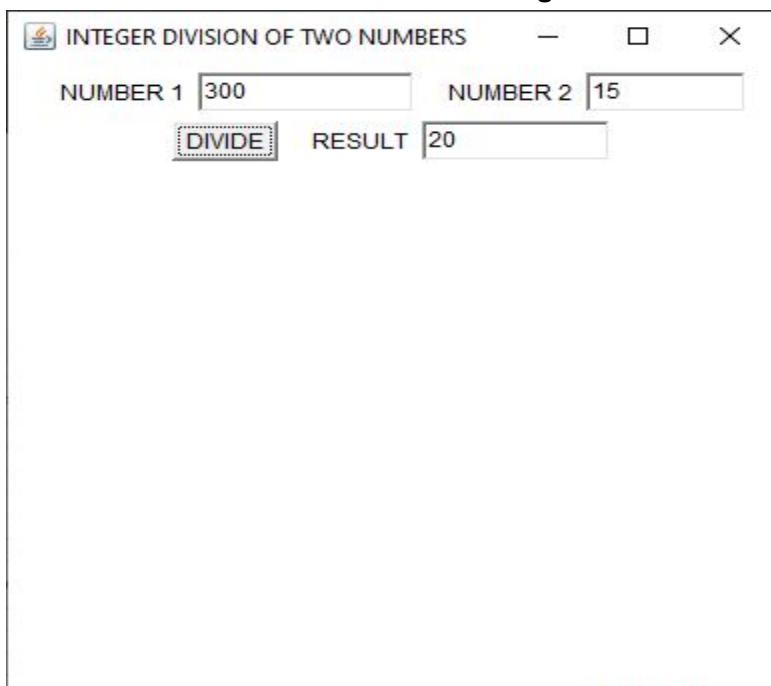
OUTPUT:

```

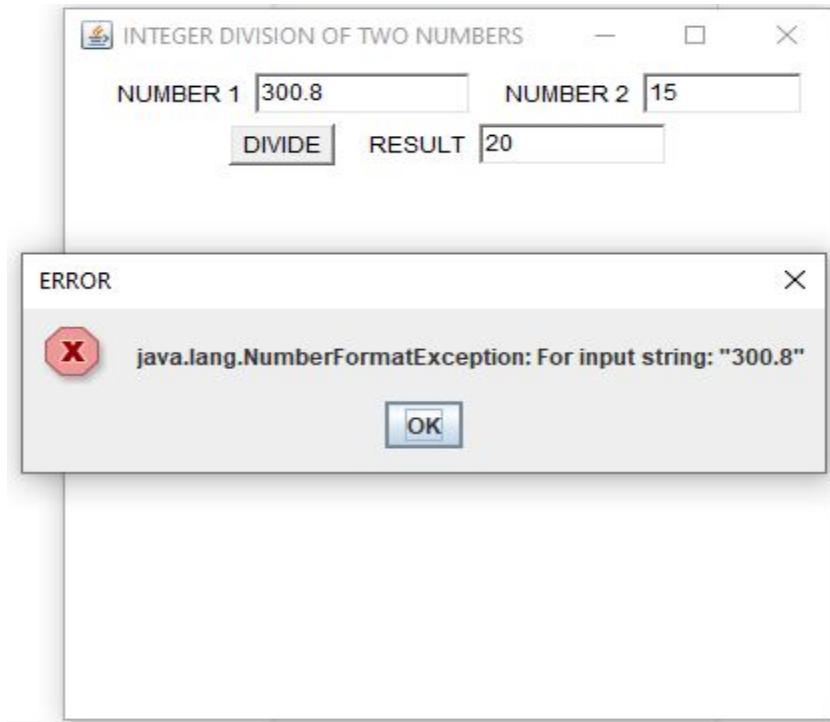
D:\Kusum\III SEMESTER\OOJ2020>javac lab10.java
D:\Kusum\III SEMESTER\OOJ2020>java integerdivision

```

CASE 1:Both Num1 and Num2 are integers



CASE 2:If Num1, Num2 is/are decimal type



CASE 3:If Num2 is zero

