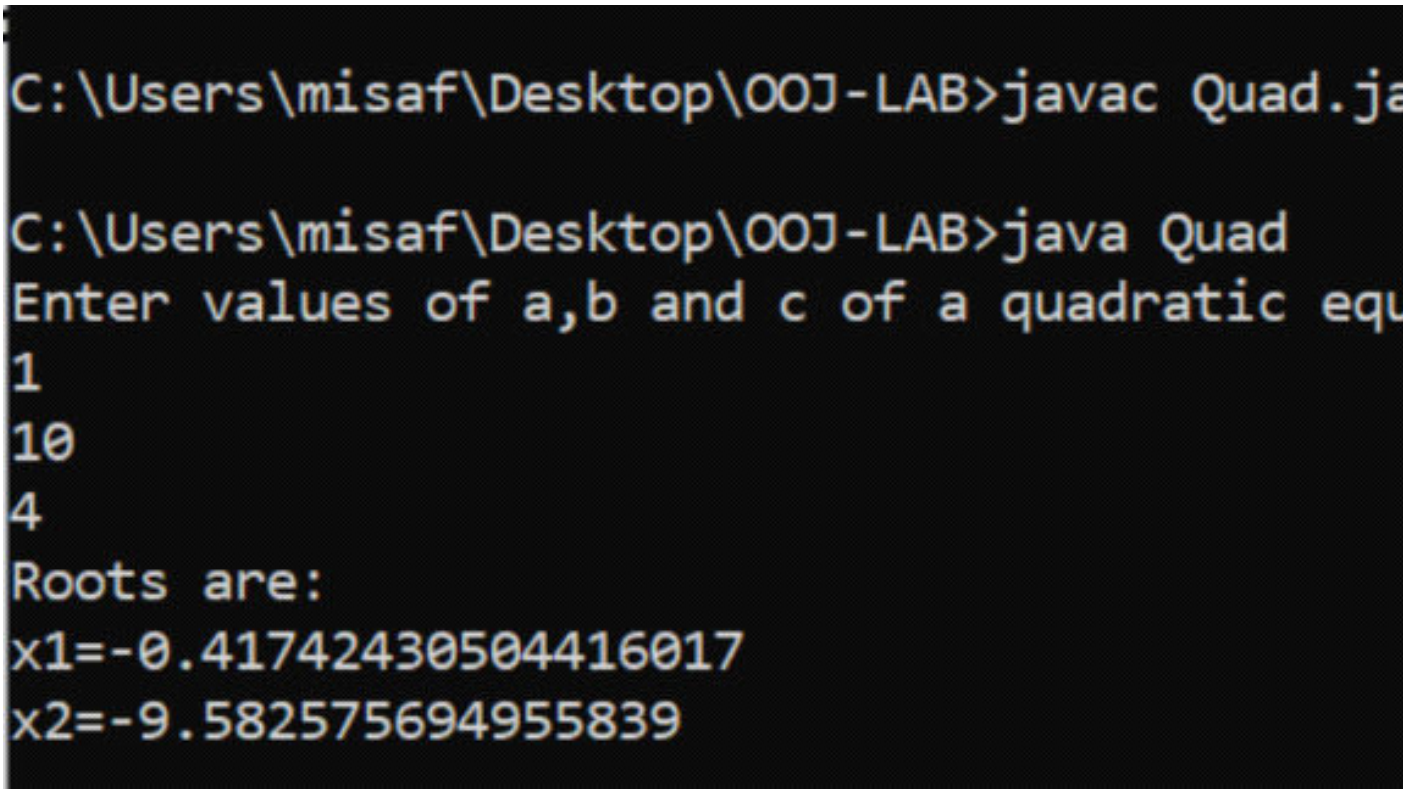
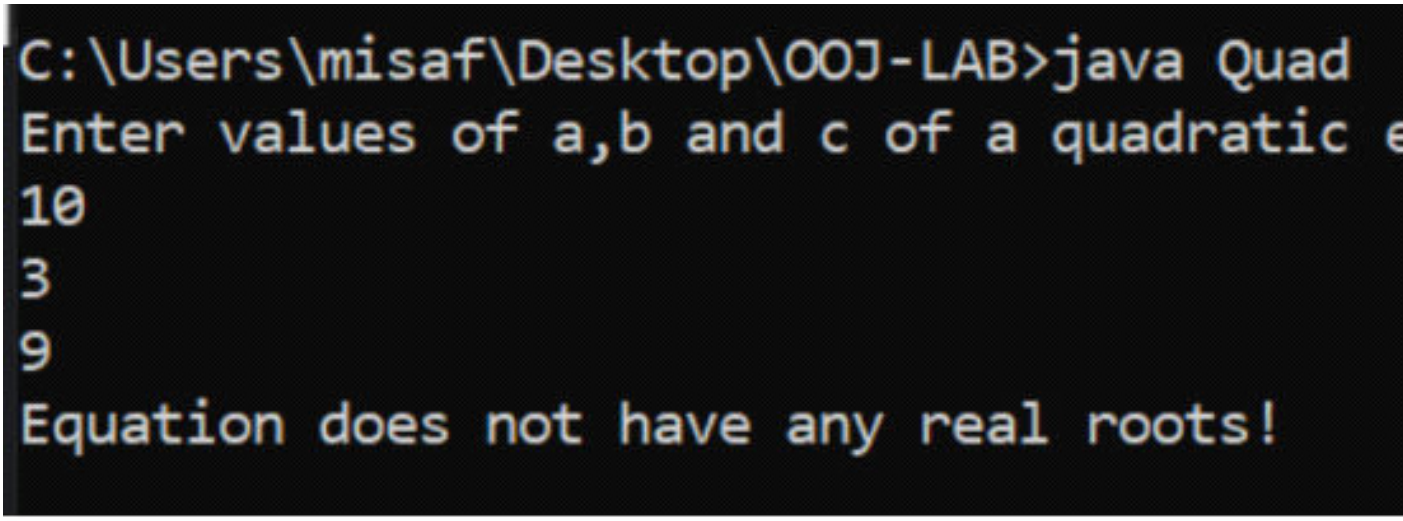
1) Develop a Java program that prints all real solutions to the quadratic equation ax2+bx+c = 0. Read in a, b, c and use the quadratic formula. If the discriminate b2 -4ac is negative, display a message stating that there are no real solutions.

CODE:

Java program 1 Quadratic equations

```
import java.util.Scanner;
import java.lang.Math;
public class Quad {
    public static void main(String arg[])
    {
        System.out.println("Enter values of a, b and c
                            equation");
        Scanner sc = new Scanner(System.in);
        int a, b, c;
        a = sc.nextInt();
        b = sc.nextInt();
        c = sc.nextInt();
        double d, x1, x2;
        d = b*b - 4*a*c;
        if (d<0)
        { System.out.println("Equation does not have r
        else
        { x1 = (-b + Math.sqrt(d)) / (2*a);
          x2 = (-b - Math.sqrt(d)) / (2*a);
          System.out.println("Roots are : x1 = "+x1+" "+x2
        }
    }
}
```





---

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.

Java Program 2 Student Class :

```
import java.util.Scanner;
class Student
{   private String usn;
    private String name;
    private int[] credits = new int[5]
    private int[] marks = new int[5]
    void getData()
    {   Scanner sl = new Scanner(System.in);
        System.out.println("Enter student usn");
        usn = sl.next()
        System.out.println("Enter name:");
        name = sl.next()
        int i;
        for(i=0; i<5; i++)
        { System.out.println("Enter credit of sub "+(i
          credits[i] = sl.nextInt();
          System.out.println("Enter marks "+(i+1));
          mark[i] = sl.nextInt();
        }
    }
    float calculate()
    {   int i=0, gpa;
        float total=0, td=0;
        for(i=0; i<5; i++)
        {   if(marks[i]>=90)
                gpa=10;
            else if(marks[i]>=80)
                gpa=9;
            else if(marks[i]>=70)
```

```
            else
                gpa = 3;
            total = total + credits[i] * gpa;
            td = td + credits[i];
        }
        return (total/td);
    }
    void display()
    { System.out.println("USN: " +usn);
      System.out.println("Name: " +name);
      System.out.println("SGPA: " +calculate());
    }
}
public class StudentMain
{
    public static void main(String args[])
    {
        Student s = new Student();
        s.getData();
        s.display();
    }
}
```

```
Enter student usn
1BM19CS000
Enter student name
KARAN
Enter credits of subject1
5
Enter marks of subject1
80
Enter credits of subject2
4
Enter marks of subject2
89
Enter credits of subject3
3
Enter marks of subject3
90
Enter credits of subject4
2
Enter marks of subject4
60
Enter credits of subject5
1
Enter marks of subject5
80
USN :1BM19CS000
```

---

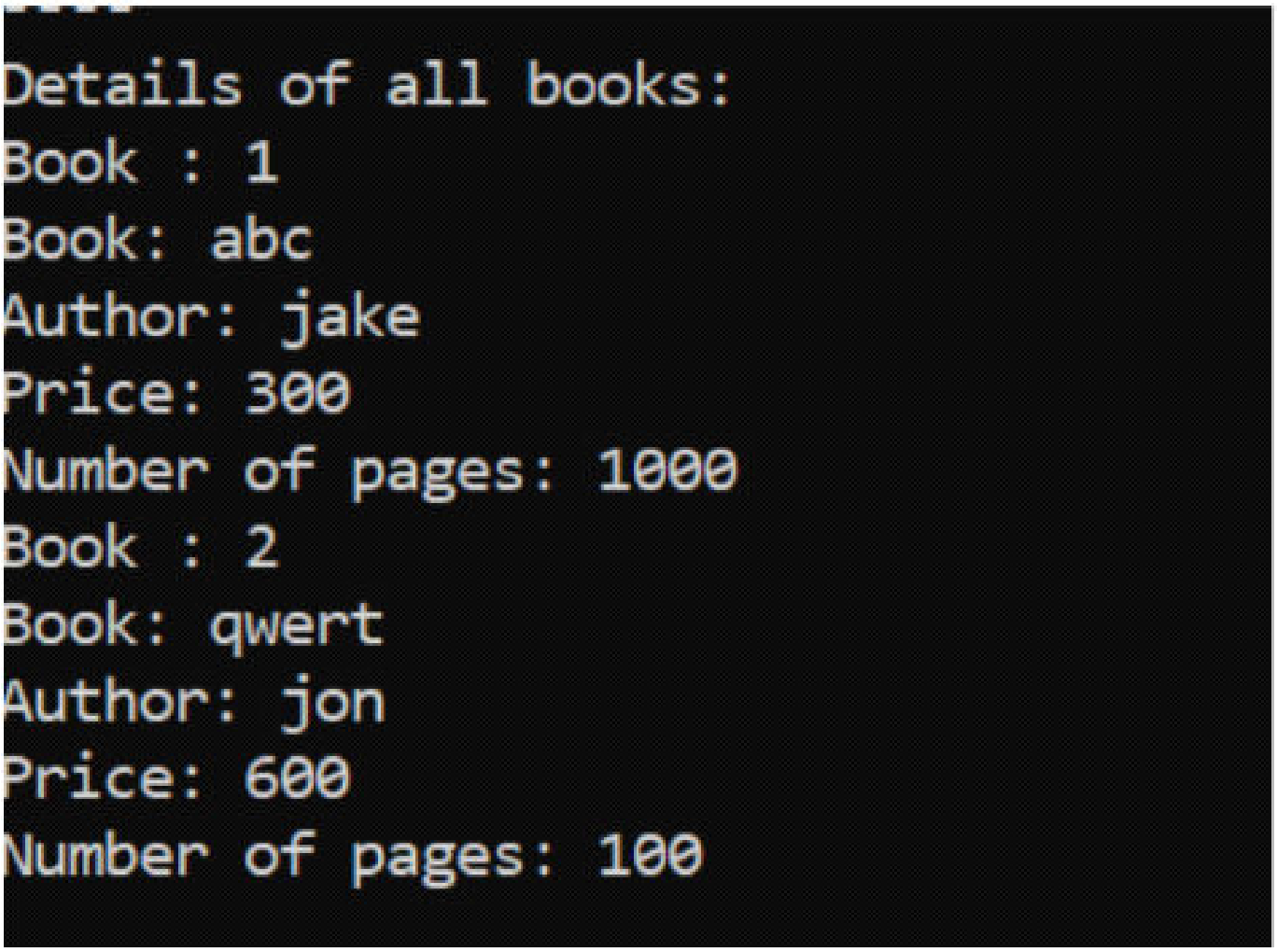
3) Create a class Book which contains four members: name, author, price, num_pages. Include a constructor to set the values for the members. Include methods to set and get the details of the objects. Include a toString( ) method that could display the complete details of the book. Develop a Java program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

Book Class:

```
import java.util.Scanner;
class Book
{   String name;
    String author;
    String price;
    String num_pages;
    public Book(){
        name = "abc";
        author = "xyz";
        price = "1005";
        numpages = "500";
        }
    void getData()
{   Scanner sl = new Scanner(System.in);
    System.out.println("Enter Book name: ");
    name = sl.next();
    System.out.println("Enter author name: ");
    author = sl.next();
    System.out.println("Enter price: ");
    price = sl.next();
    System.out.println("Enter pages:");
    num_pages = sl.next();
}
public String toString() {
```

```
public class BookMain
{
    public static void main (String args[])
    {
        int i,n;
        Book obj = new Book();
        System.out.println("Constructor values:");
        System.out.println(obj.toString());
        System.out.println("Enter number of books:");
        Scanner s = new Scanner(System.in);
        n = s.nextInt();
        Book[] ob = newBook[n];
        for(i=0; i<n; i++)
        {
            ob[i] = new Book();
            ob[i] = getData();
        }
        System.out.println("Details:");
        for(i=0; i<n; i++)
        {
            System.out.println(ob[i].toString());
        }
    }
}
```

```
C:\Users\misaf\Desktop\OOJ-LAB>java B
Constructor values:
Book: abc
Author: xyz
Price: 100rs
Number of pages: 500
Enter number of books:
2
Enter Book name:
abc
Enter Author name:
jake
Enter Book price:
300
Enter number of pages:
1000
----
Enter Book name:
qwert
Enter Author name:
jon
Enter Book price:
600
Enter number of pages:
100
```



---

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.

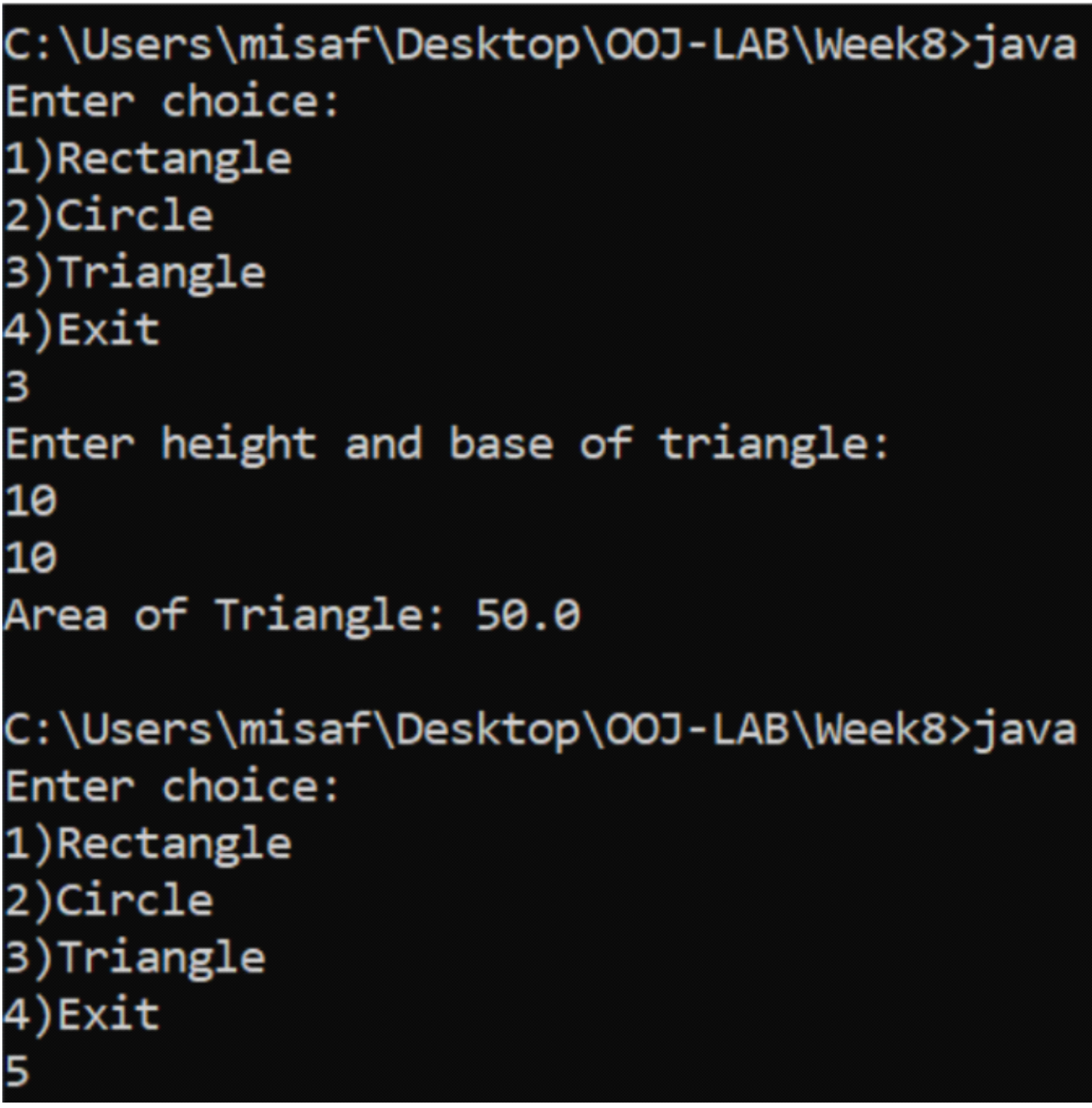
Week 8

Shapes

Code:

```
import java.util.Scanner;
abstract class Shapes {
        int a;
        int b;
        abstract void printArea();
}
class Rectangle extends Shapes {
        void printArea()
        {   System.out.println("Area of Rectangle: " + a*b);
        }
}
class Circle extends Shapes {
        void printArea()
        {   System.out.println("Area of Circle: " + 3.14*a
        }
}
class Triangle extends Shapes {
        void printArea()
        {   System.out.println("Area of Triangle: " + 0.5*
        }
}
class ShapesMain {
```

```
Scanner sc = new Scanner(System.in);
Rectangle r = new Rectangle();
Circle c = new Circle();
Triangle t = new Triangle();
int check = 1, choice;
while (check == 1)
{ System.out.println("Enter choice : (1) Rectangle (2) Ci
                                    Triangle (3) (4) Exit");

  choice = sc.nextInt();
  switch (choice)
  {
  case 1: System.out.println("Enter length & breadth
          r.a = sc.nextInt();
          r.b = sc.nextInt();
          r.printArea();

  case 2: System.out.println("Enter radius of Circle :
          c.a = sc.nextInt();
          c.printArea();

  case 3: System.out.println("Enter height & ba
          t.a = sc.nextInt();
          t.b = sc.nextInt();
          t.printArea();

  default : check = 0;
  }

}

}
```



---

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.**

Week 8

Bank :

```
import java.util.Scanner;
import java.lang.Math;
class Account {
    String name;
    int acc_num;
    int type;
    double balance = 0;
    void accept_deposit()
    {
        Scanner sc = new Scanner(System.in);
        System.out.println("Enter amount to be deposited");
        float depo;
        depo = sc.nextFloat();
        balance = balance + depo;
    }
    void withdraw()
    {
        Scanner sc = new Scanner(System.in);
        System.out.println("Enter amount to withdraw");
        float wid;
        wd = sc.nextFloat();
        balance = balance - wid;
    }
    void getData()
    {
        Scanner sc = new Scanner(System.in);
        System.out.println("Enter name of customer:");
        name = sc.next();
        System.out.println("Enter Account Number:");
        acc_num = sc.nextInt();
        System.out.println("Press 1 for Savings account In Press 2 for
        type = sc.nextInt(); Current Account");
```

```
class Savings_acc extends Account {
    void calc_ci (float t)
    {   double r = 0.05;
        int n = 12;
        double temp = balance;
        balance = balance * Math.pow((1+r/n), n*t);
        System.out.println ("CI added: " + (balance - temp));
    }
    void display()
    {   System.out.println ("Balance : " + balance);
    }
}

class Curr_acc extends Account{
    void calc_penalty()
    {   balance = balance - 500; }
    void display()
    {   if (balance > 5000)
        {   System.out.println ("Balance : " + balance); }
        else
        {
            System.out.println ("Your account does not have minimum
balance of Rs 5000, hence penalty Rs 500 is being charged");
            calc_penalty();
            System.out.println ("Balance : " + balance);
        }
    }
}
public class Bank{
    public static void main (String args[])
    {
```

```
Scanner sc = new Scanner (System.in);
Account a = new Account();
Curr_acc ca = new Curr_ac();
Savings_acc s = new Savings_acc();
a.getData();
int c, choice;
float t;
c = a.type;
if (c==1)
{   while(c==1)
    {
        System.out.println(" Enter code of your
        :\n1) View Balance 2) Deposit Amount \n
        \n4) Exit ");
        choice = sc.nextInt();
        switch(choice)
        {
          case 1: System.out.println(" Enter the
                  after which balance is being che
                  t = sc.nextFloat();
                  s.calc_ci(t);
                  s.display();
                  break;
          case 2:  s.accept_deposit(); break;
          case 3:  s.withdraw(); break;
          default :  c=0;
        }
    }
```

```
if(c==2)
{
    while (c==2)
    {
        System.out.println("Enter code:\n1) View Balance \n 2) D
                            \n 3) Withdraw \n 4) Exit");

        choice = sc.nextInt();
        switch (choice)
        {
            case 1 : ca.display(); break;
            case 2 : ca.accept_deposit(); break;
            case 3 : ca.withdraw(); break;
            default : c=0;
        }
    }
}
}
```

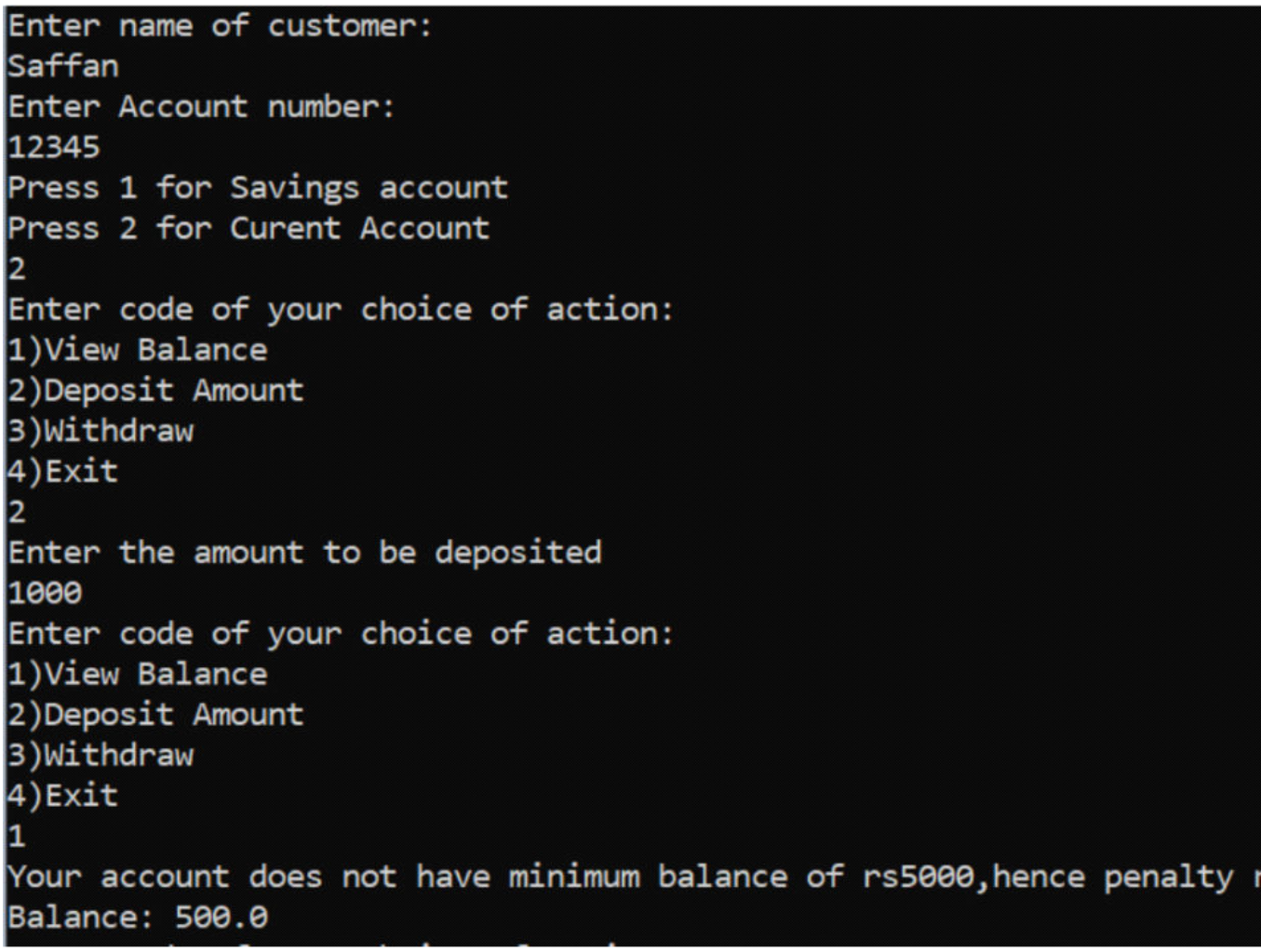
FOR SAVINGS ACCOUNT:

```
Enter name of customer:
Saffan
Enter Account number:
12345
Press 1 for Savings account
Press 2 for Curent Account
1
Enter code of your choice of action:
1)View Balance
2)Deposit Amount
3)Withdraw
4)Exit
1
Enter the number of years after which balance is being checked(to calcula
1
CI added:0.0
Balance:0.0
Enter code of your choice of action:
1)View Balance
2)Deposit Amount
3)Withdraw
4)Exit
2
Enter the amount to be deposited
50000
```

```
Enter code of your choice of action:
1)View Balance
2)Deposit Amount
3)Withdraw
4)Exit
1
Enter the number of years after which balance is being checked(to calcul
2
CI added:5247.066777916341
Balance:55247.06677791634
Enter code of your choice of action:
1)View Balance
2)Deposit Amount
3)Withdraw
4)Exit
3
Enter the amount to be withdrawn
25000
Enter code of your choice of action:
1)View Balance
2)Deposit Amount
3)Withdraw
4)Exit
1
Enter the number of years after which balance is being checked(to calcul
1
CI added:1547.4973417137153
Balance:31794.564119630057
```

```
Enter code of your choice of ac
1)View Balance
2)Deposit Amount
3)Withdraw
4)Exit
4
```

FOR CURRENT ACCOUNT:



```
Balance: 500.0
Enter code of your choice of action:
1)View Balance
2)Deposit Amount
3)Withdraw
4)Exit
2
Enter the amount to be deposited
10000
Enter code of your choice of action:
1)View Balance
2)Deposit Amount
3)Withdraw
4)Exit
3
Enter the amount to be withdrawn
3000
Enter code of your choice of action:
1)View Balance
2)Deposit Amount
3)Withdraw
4)Exit
1
Balance: 7500.0
Enter code of your choice of action:
```

---

6)Create a package CIE which has two classes- Student and Internals. Theclass Personal has members like usn, name, sem. The class Internals has anarray that stores the internal marks scored in five courses of the currentsemester of the student. Create another package SEE which has the classExternal which is a derived class of Student. This class has an array thatstores the SEE marks scored in five courses of the current semester of thestudent. Import the two packages in a file that declares the final marks of nstudents in all five courses.

CODE:

Week 9

Lab - program - 6 :

CIE package :

Student class :

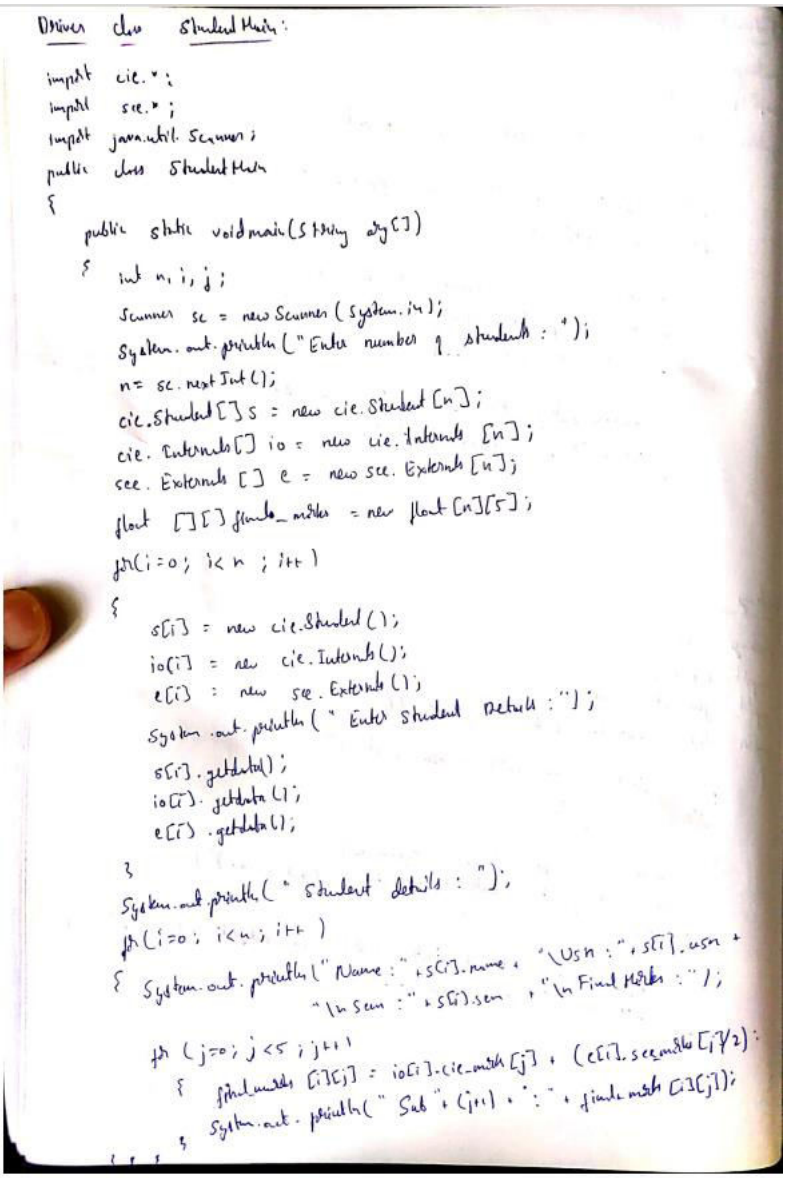
```
package cie ;
import java.util.Scanner ;
public class Student
{
    public String usn;
    public String name ;
    public int sem ;

    public void getData()
    {
        Scanner sc = new Scanner(System.in) ;
        System.out.println("Enter name : ");
        name = sc.next() ;
        System.out.println("Enter usn : ");
        usn = sc.next() ;
        System.out.println(" Enter sem : ");
        sem = sc.nextInt() ;

    }

}
```

Internals class :

```
package cie ;
import java.util.Scanner;
public class Internals extends cie.Student
{
    public float [] cie_marks = new float [5];
    public void getdata ()
    {
        Scanner sc = new Scanner (System.in);
        System.out.println(" Enter CIE marks :");
        for (int i=0; i<5; i++)
        {
            System.out.println(" Enter marks in sub "+ (i+1)+"(out of 50) :");
            cie_marks [i]=sc.nextFloat();
        }
    }
}
```

Package see :

```
package see ;
import cie.* ;
import java.util.Scanner;
public class Externals extends cie.Student
{
    public float [] see_marks = new float [5];
    public void getdata ()
    {
        Scanner sc = new Scanner (System.in);
        System.out.println("Enter SEE marks : (out of 100)");
        for (int i=0 ; i<5; i++)
        {
            System.out.println ("Enter marks in subject "+(i+1)+":");
            see_marks [i] = sc.nextFloat();
        }
    }
}
```

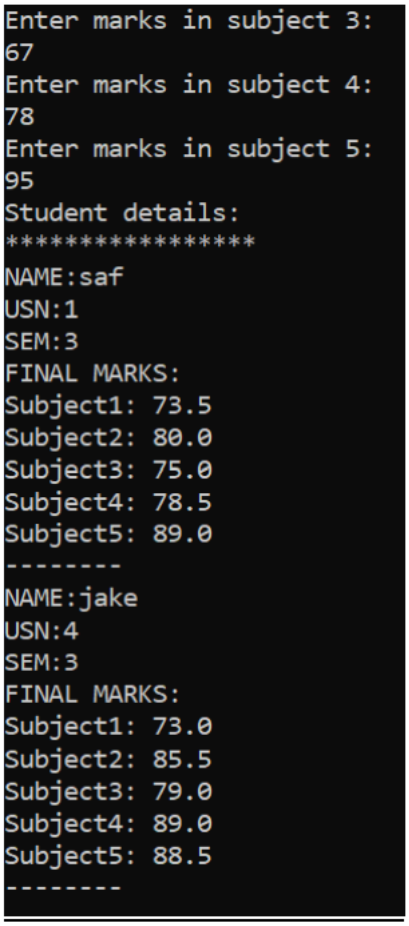


```
Driver class StudentMain:

import cie.*;
import see.*;
import java.util.Scanner;
public class StudentMain
{
    public static void main(String arg[])
    {
        int n, i, j;
        Scanner sc = new Scanner(System.in);
        System.out.println("Enter number of students : ");
        n= sc.nextInt();
        cie.Student[] s = new cie.Student[n];
        cie.Internals[] io = new cie.Internals[n];
        see.Externals[] e = new see.Externals[n];
        float [][] final_marks = new float[n][5];
        for(i=0; i<n ; i++)
        {
            s[i] = new cie.Student();
            io[i] = new cie.Internals();
            e[i] = new see.Externals();
            System.out.println("Enter student details : ");
            s[i].getdata();
            io[i].getdata();
            e[i].getdata();
        }
        System.out.println("Student details : ");
        for(i=0; i<n; i++)
        { System.out.println("Name :" +s[i].name + "\Usn :", s[i].usn +
                            "\n Sem :" +s[i].sem , "\n Final Marks : ");
            for (j=0; j<5 ; j++)
            { final_marks[i][j] = io[i].cie_marks[j] + (e[i].see_marks[i]/2);
              System.out.println("Sub "+(j+1)+ ":" + final_marks[i][j]);
            }
```

OUTPUT:

```
C:\Users\misaf\Desktop\OOJ-LAB\Week9>j

C:\Users\misaf\Desktop\OOJ-LAB\Week9>j
Enter the number of students:
2
Enter Student details of student 1:
---------------------------------
Enter name:
saf
Enter usn:
1
Enter sem:
3
Enter CIE marks:
Enter marks in subject 1(out of 50):
30
Enter marks in subject 2(out of 50):
40
Enter marks in subject 3(out of 50):
36
Enter marks in subject 4(out of 50):
29
Enter marks in subject 5(out of 50):
39
Enter SEE marks:(out of 100)
Enter marks in subject 1:
87
Enter marks in subject 2:
80
```

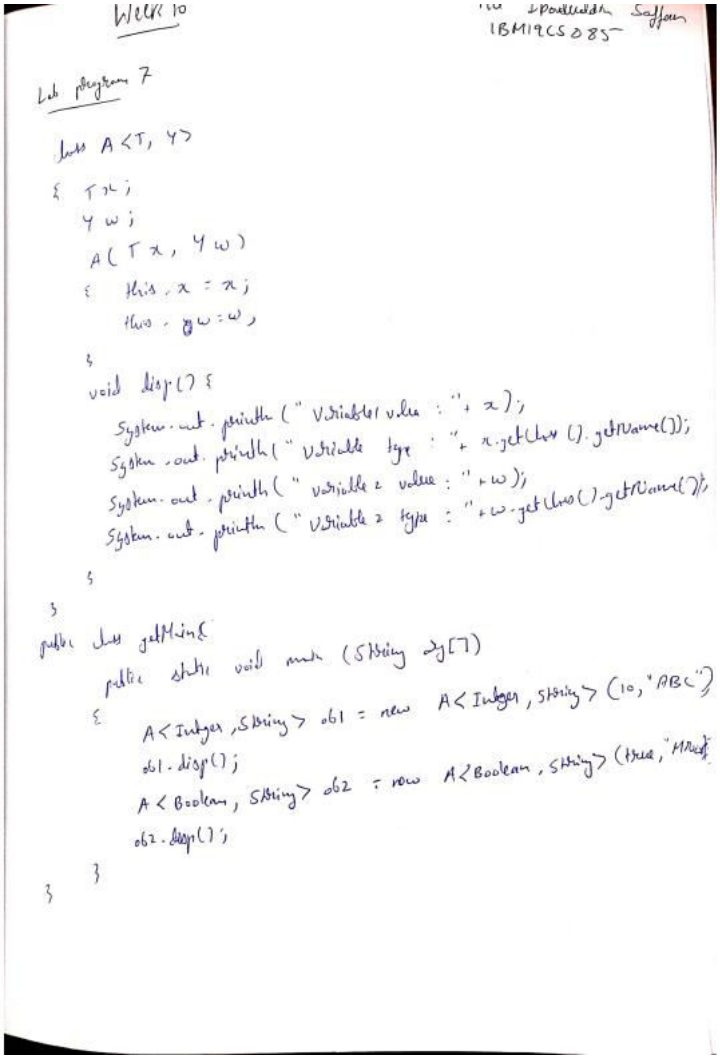
```
Enter marks in subject 3:
78
Enter marks in subject 4:
99
Enter marks in subject 5:
100
Enter Student details of student 2:
---------------------------------
Enter name:
jake
Enter usn:
4
Enter sem:
3
Enter CIE marks:
Enter marks in subject 1(out of 50):
34
Enter marks in subject 2(out of 50):
36
Enter marks in subject 3(out of 50):
45.5
Enter marks in subject 4(out of 50):
50
Enter marks in subject 5(out of 50):
41
Enter SEE marks:(out of 100)
Enter marks in subject 1:
78
Enter marks in subject 2:
99
```



---

7) Write a program to demonstrate generics with multiple object parameters.

CODE:



Week 10

IBM19CS085

Lab Program 7

```
class A<T, Y>
{ T x;
  Y w;
  A(T x, Y w)
  { this.x = x;
    this.yw = w;
  }
  void disp() {
    System.out.println("Variable1 value : "+ x);
    System.out.println("Variable1 type : "+ x.getClass().getName());
    System.out.println("Variable2 value : "+w);
    System.out.println("Variable2 type : "+w.getClass().getName());
  }
}
public class genMain{
  public static void main (String arg[])
  {
    A<Integer,String> ob1 = new A<Integer, String>(10,"ABC");
    ob1.disp();
    A<Boolean, String> ob2 = new A<Boolean, String>(true,"MNOP");
    ob2.disp();
  }
}
```

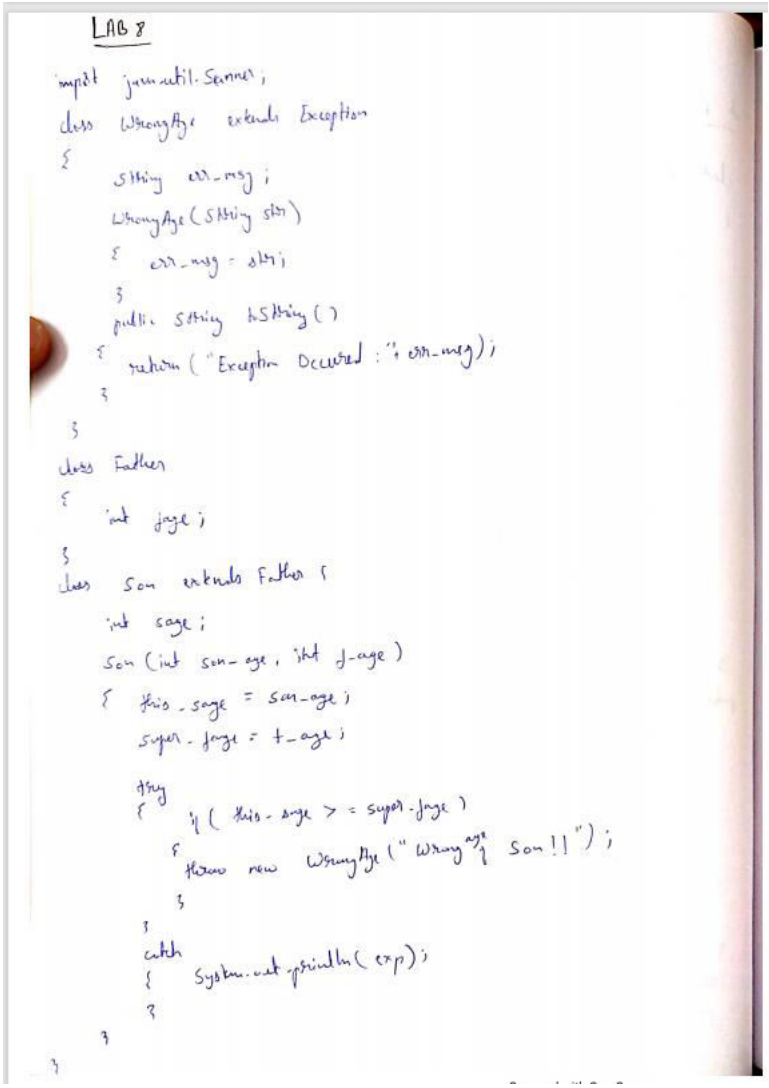
OUTPUT:

```
C:\Users\misaf\Desktop\OOJ-LAB\Week10>java genMain
Variable1 value: 10
Variable1 type :java.lang.Integer
Variable2 value: ABCD
Variable2 type :java.lang.String
Variable1 value: true
Variable1 type :java.lang.Boolean
Variable2 value: MNOP
Variable2 type :java.lang.String
```

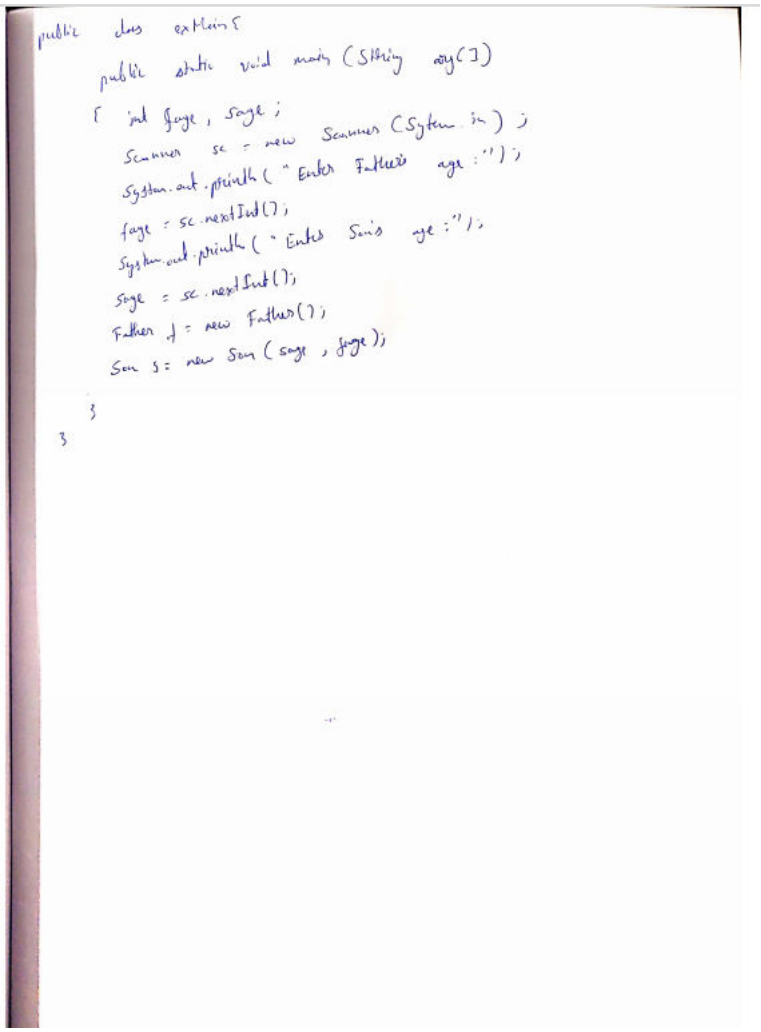
---

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.

CODE:



```
LAB 8
import java.util.Scanner;
class WrongAge extends Exception
{
    String err_msg;
    WrongAge(String str)
    {  err_msg = str;
    }
    public String toString()
    {  return ("Exception Occured : "+ err_msg);
    }
}
class Father
{
    int fage;
}
class Son extends Father {
    int sage;
    Son(int son_age, int f_age)
    {  this.sage = son_age;
       super.fage = f_age;
       try
       {   if ( this.sage >= super.fage )
           {  throw new WrongAge("Wrong age for Son!!");
           }
       }
       catch
       {   System.out.println(exp);
       }
    }
}
```



```
public class exMain {
    public static void main (String arg[])
    {  int fage, sage;
       Scanner sc = new Scanner (System.in);
       System.out.println("Enter Father's age:");
       fage = sc.nextInt();
       System.out.println("Enter Son's age:");
       sage = sc.nextInt();
       Father f = new Father();
       Son s= new Son(sage, fage);
    }
}
```

OUTPUT:

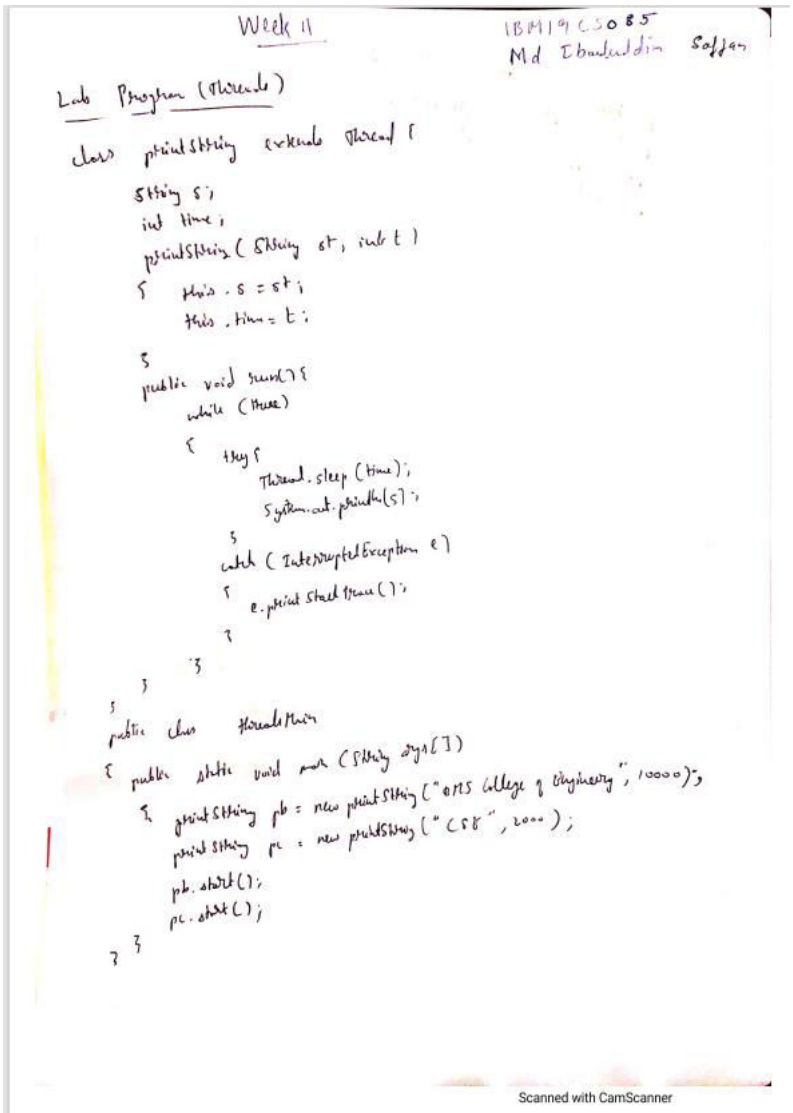
```
C:\Users\misaf\Desktop\OOJ-LAB\Week10>java exMain
Enter father's age:
50
Enter Son's age:
60
S age:60 F age:50
Exception Occurred: Age of Son can't be more than or equal to that of father!!
```

---

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.

CODE:



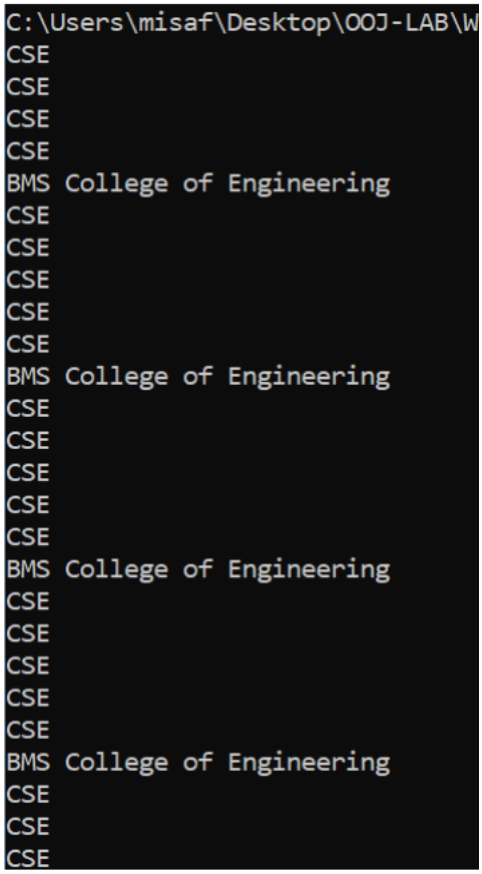
Week 11 — 1BM19CS085 — Md Ibaaduddin Saffan

Lab Program (Threads)

```
class printString extends Thread {
    String s;
    int time;
    printString(String st, int t)
    {   this.s = st;
        this.time = t;
    }
    public void run(){
        while (true)
        {   try{
                Thread.sleep(time);
                System.out.println(s);
            }
            catch (InterruptedException e)
            {   e.printStackTrace();
            }
        }
    }
public class ThreadMain
{   public static void main(String args[])
    {   printString pb = new printString("BMS College of Engineering", 10000);
        printString pc = new printString("CSE", 2000);
        pb.start();
        pc.start();
    }
}
```

Scanned with CamScanner

OUTPUT:



---

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.

CODE:

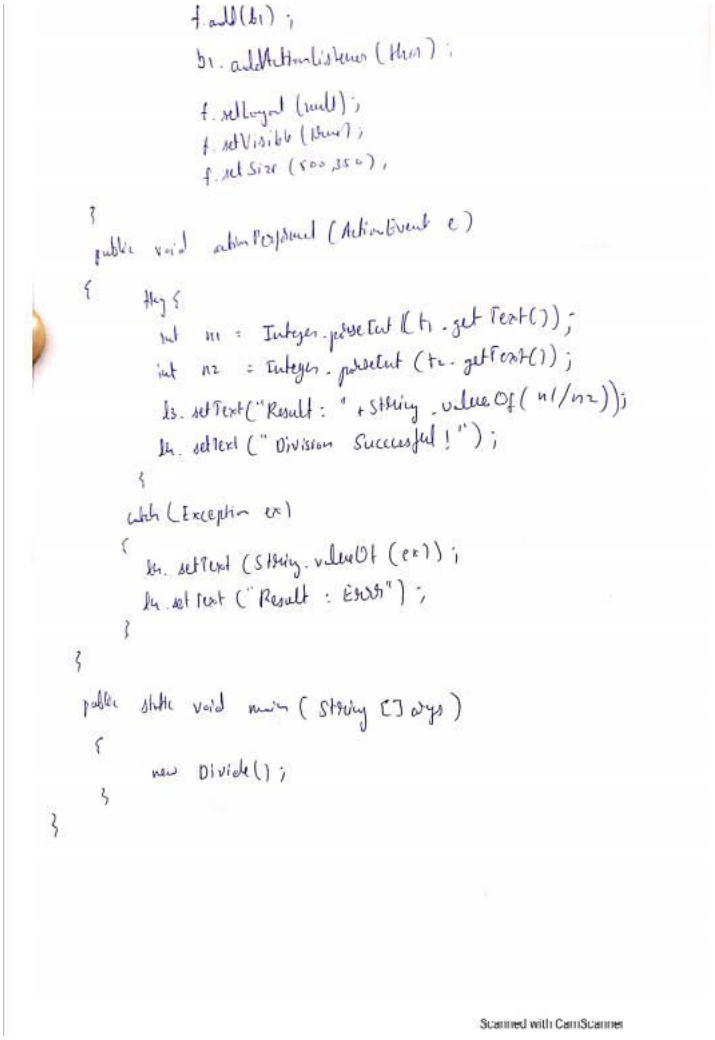
WEEK 12

1BM19CS085

MD IBADUDDIN SAFFAN

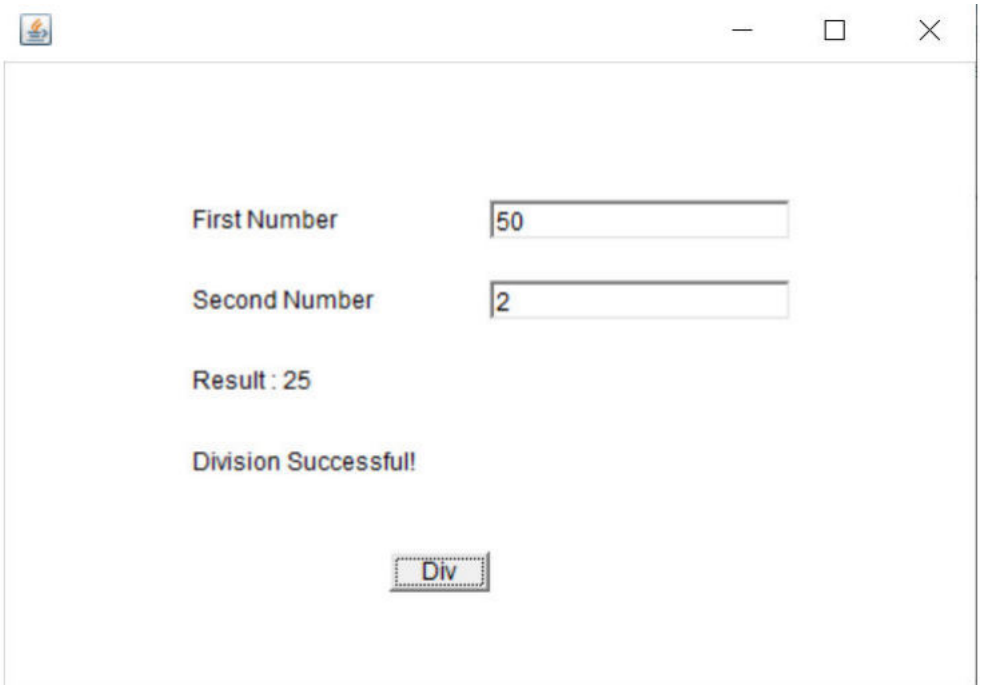
LAB PROGRAM (Integer Div)

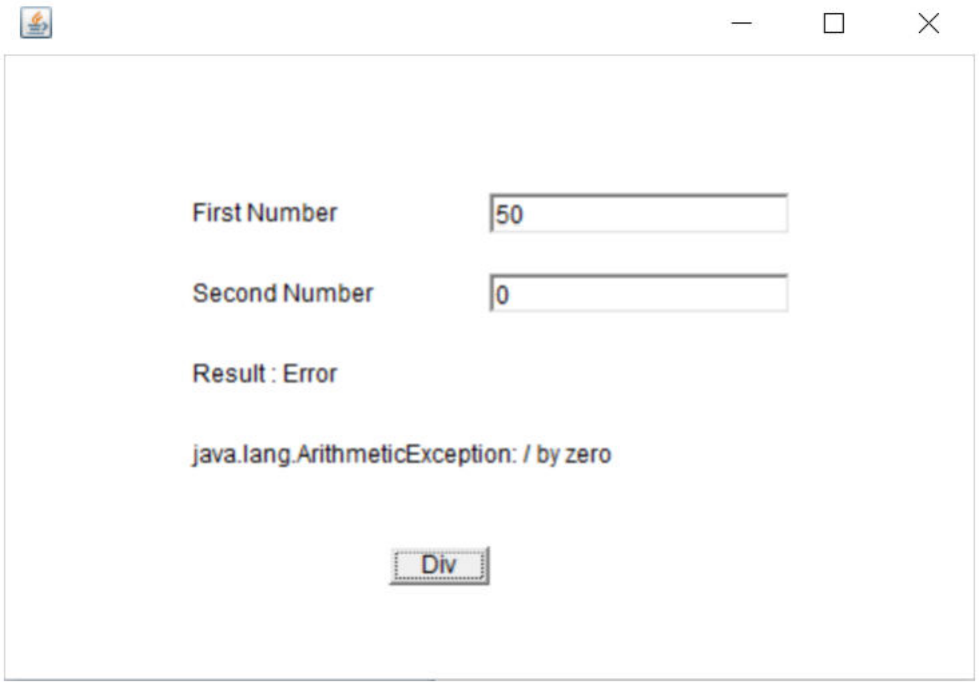
```
import java.awt.*;
import java.awt.event.*;

public class Divide implements ActionListener
{
    Frame f = new Frame();
    Label l1 = new Label("First Number");
    Label l2 = new Label("Second Number");
    Label l3 = new Label();
    Label l4 = new Label();

    TextField t1 = new TextField();
    TextField t2 = new TextField();

    Button b1 = new Button("Div");

    Divide()
    {
        l1.setBounds(100, 100, 100, 20);
        l2.setBounds(100, 140, 100, 20);
        l3.setBounds(100, 220, 300, 20);

        t1.setBounds(250, 100, 150, 20);
        t2.setBounds(250, 140, 150, 20);

        b1.setBounds(200, 275, 50, 20);

        f.add(l1);
        f.add(l2);
        f.add(l3);
        f.add(l4);
        f.add(t1);
        f.add(t2);
```

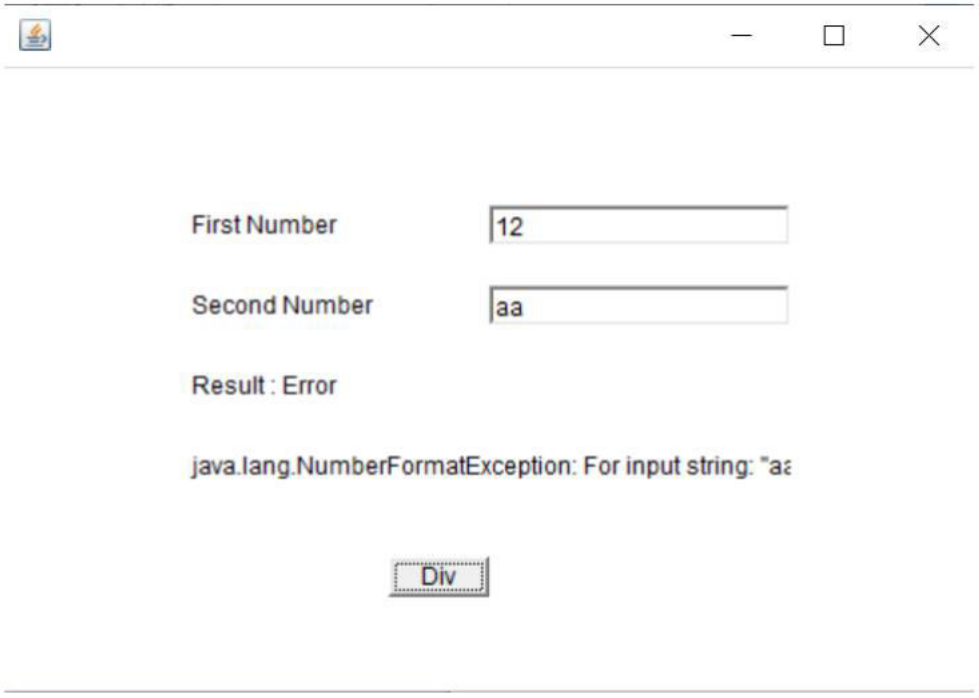


```
        f.add(b1);
        b1.addActionListener(this);

        f.setLayout(null);
        f.setVisible(true);
        f.setSize(500,350);

    }
    public void actionPerformed(ActionEvent e)
    {
        try{
            int n1 = Integer.parseInt(t1.getText());
            int n2 = Integer.parseInt(t2.getText());
            l3.setText("Result: "+String.valueOf(n1/n2));
            l4.setText("Division Successful!");
        }
        catch(Exception ex)
        {
            l3.setText(String.valueOf(ex));
            l4.setText("Result: Error");
        }
    }
    public static void main(String[] args)
    {
        new Divide();
    }
}
```


OUTPUT:


First Number
50
Second Number
2
Result : 25
Division Successful!
Div


First Number
50
Second Number
0
Result : Error
java.lang.ArithmeticException: / by zero
Div


First Number
12
Second Number
aa
Result : Error
java.lang.NumberFormatException: For input string: "aa
Div