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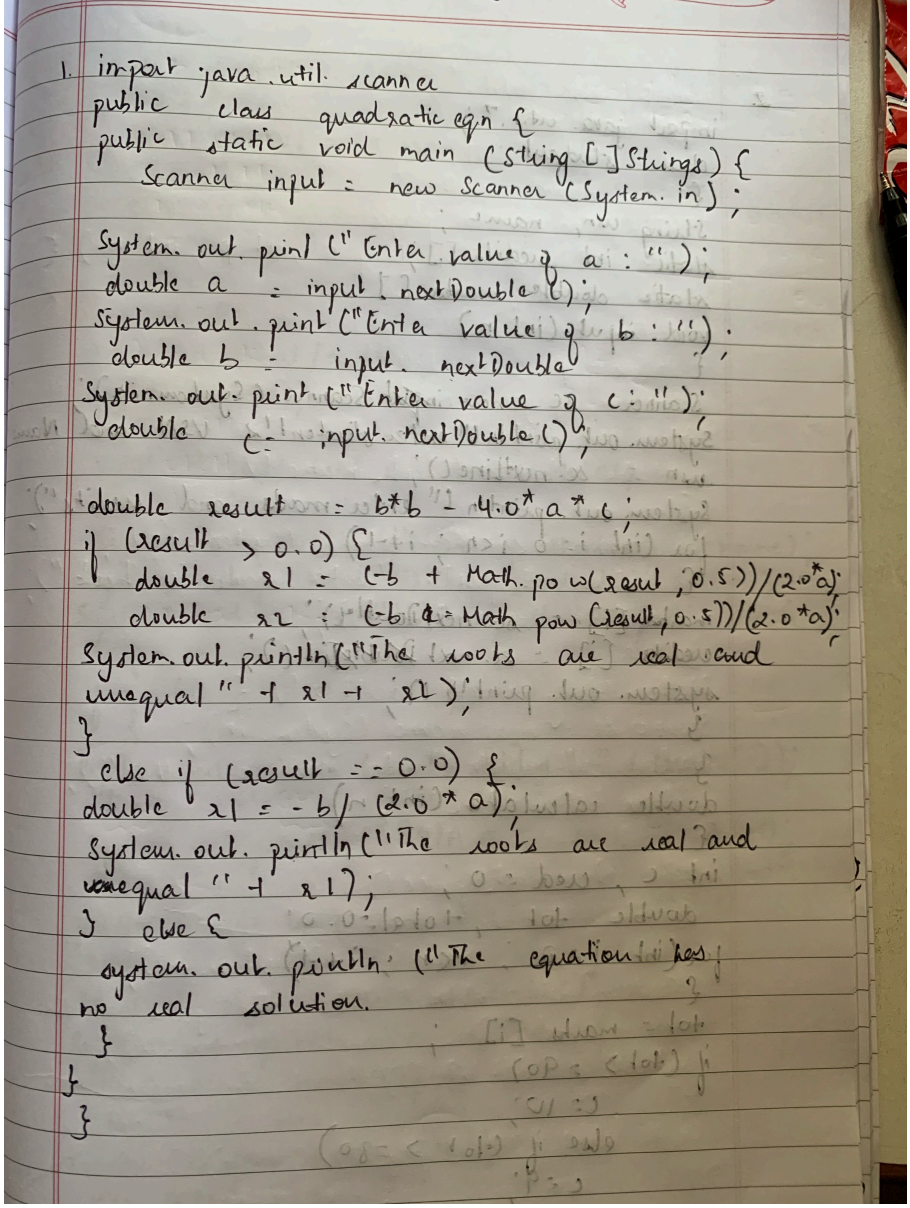
1BM19CS105

Lab Program 1:

Develop a Java program that prints all real solutions to the quadratic equation ax2 +bx+c = 0.

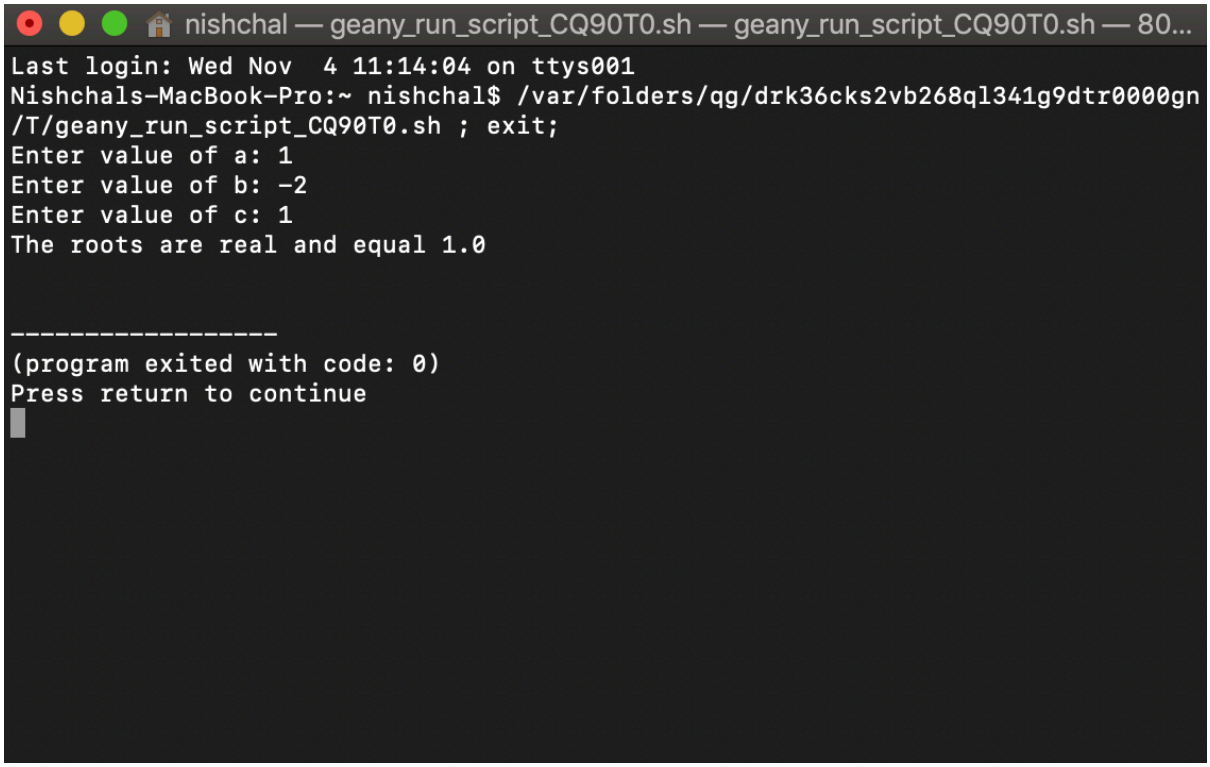
Read in a, b, c and use the quadratic formula. If the discriminate b2-4ac is negative, display a message stating that there are no real solutions.

```
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);

		}

	}

}
```



```
1. import java.util.Scanner
public class quadratic eqn {
public static void main (String [] Strings) {
   Scanner input = new Scanner (System.in);

System.out.print ("Enter value of a : ");
double a = input.nextDouble();
System.out.print ("Enter value of b : ");
 double b = input.nextDouble
System.out.print ("Enter value of c : ");
 double c = input.nextDouble();

 double result = b*b - 4.0* a * c;
 if (result > 0.0) {
    double r1 = (-b + Math.pow(result, 0.5))/(2.0*a);
    double r2 = (-b - Math.pow(result, 0.5))/(2.0*a);
System.out.println("The roots are real and
unequal " + r1 + r2);
}
  else if (result == 0.0) {
double r1 = -b/ (2.0 * a);
System.out.println("The roots are real and
unequal " + r1);
} else {
 system.out.println ("The equation has
no real solution.
 }
}
}
```

```
nishchal — geany_run_script_ZY0LT0.sh — geany_run_script_ZY0LT0.sh — 80...
Last login: Tue Nov 10 07:38:52 on ttys001
Nishchals-MacBook-Pro:~ nishchal$ /var/folders/qg/drk36cks2vb268ql341g9dtr0000gn
/T/geany_run_script_ZY0LT0.sh ; exit;
Enter value of a: 8
Enter value of b: 2
Enter value of c: 7
The equation has no real solution.


------------------
(program exited with code: 0)
Press return to continue
```



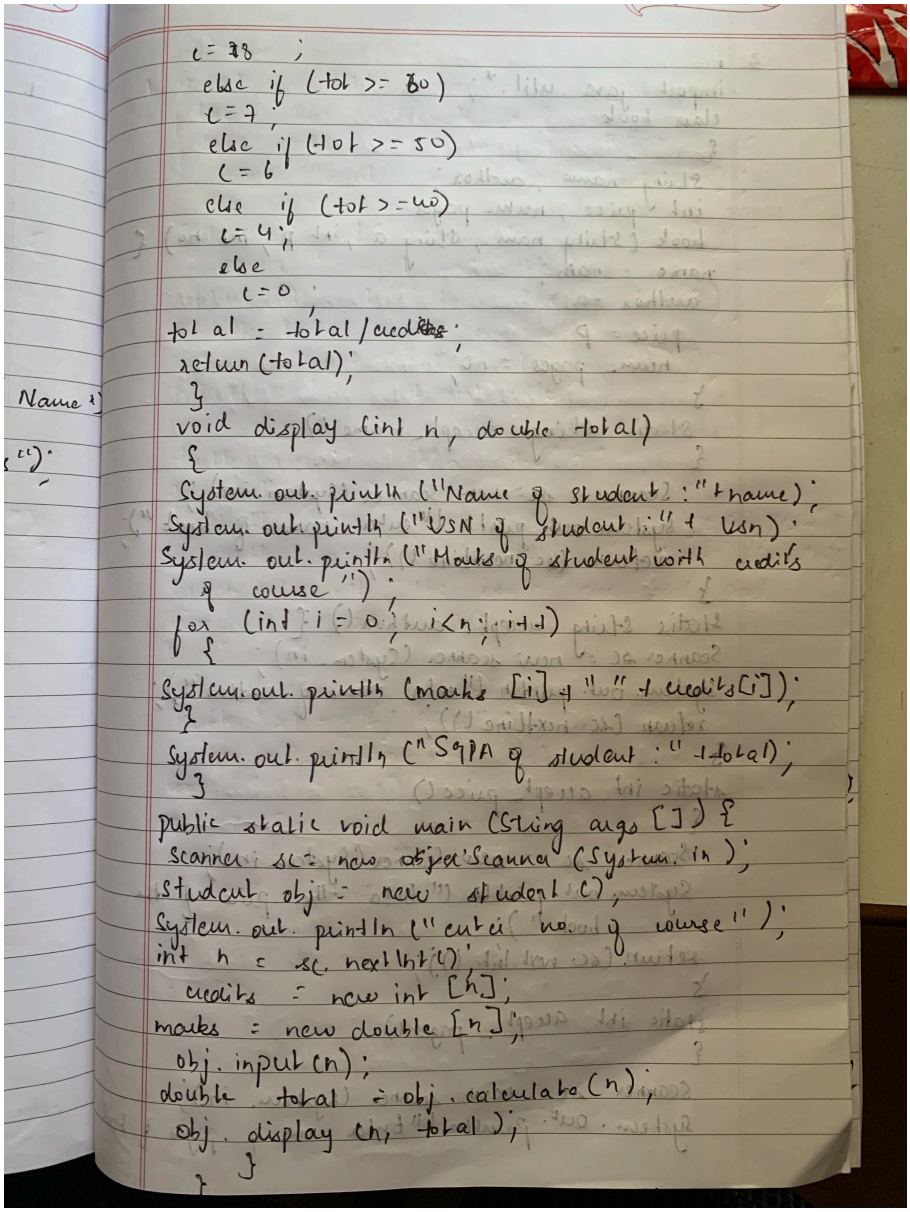
Lab Program 2:

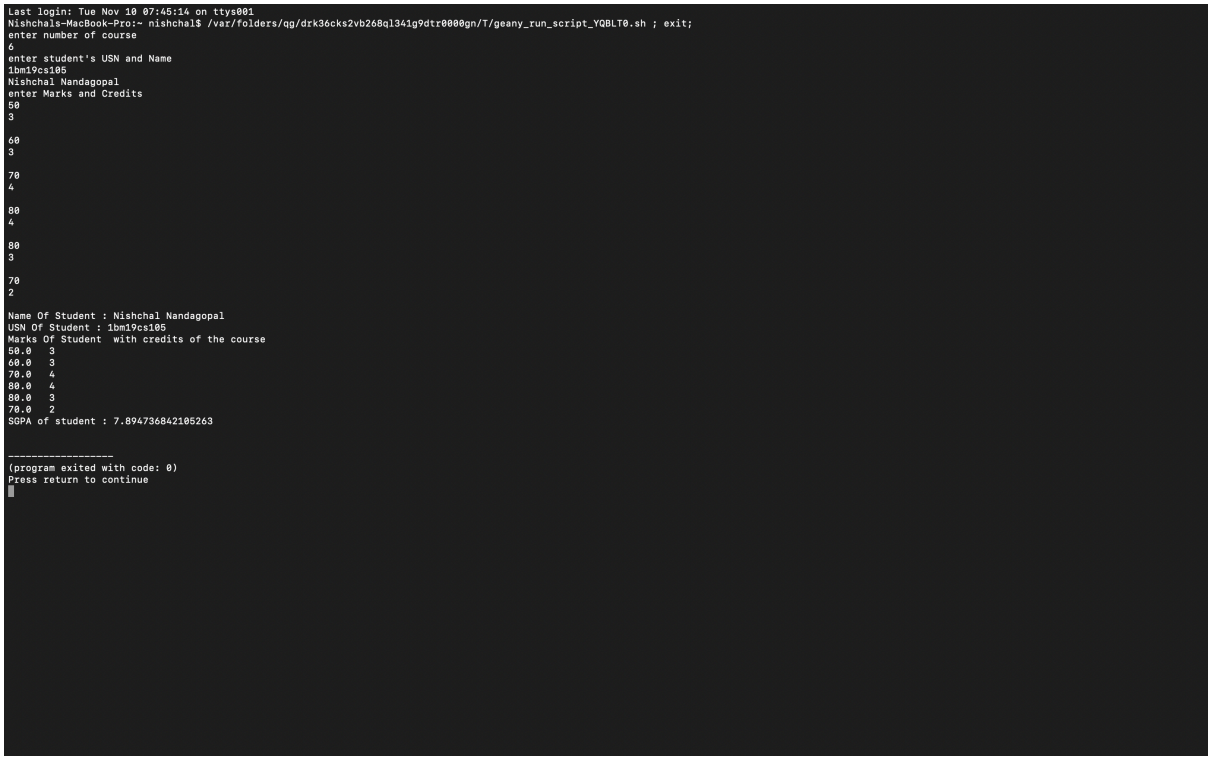
Develop a Java program to create a class Student with members usn, name, an array credits and an array marks. Include methods to accept and display details and a method to calculate SGPA of a student.

```
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);
        }
    }
```

2.

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

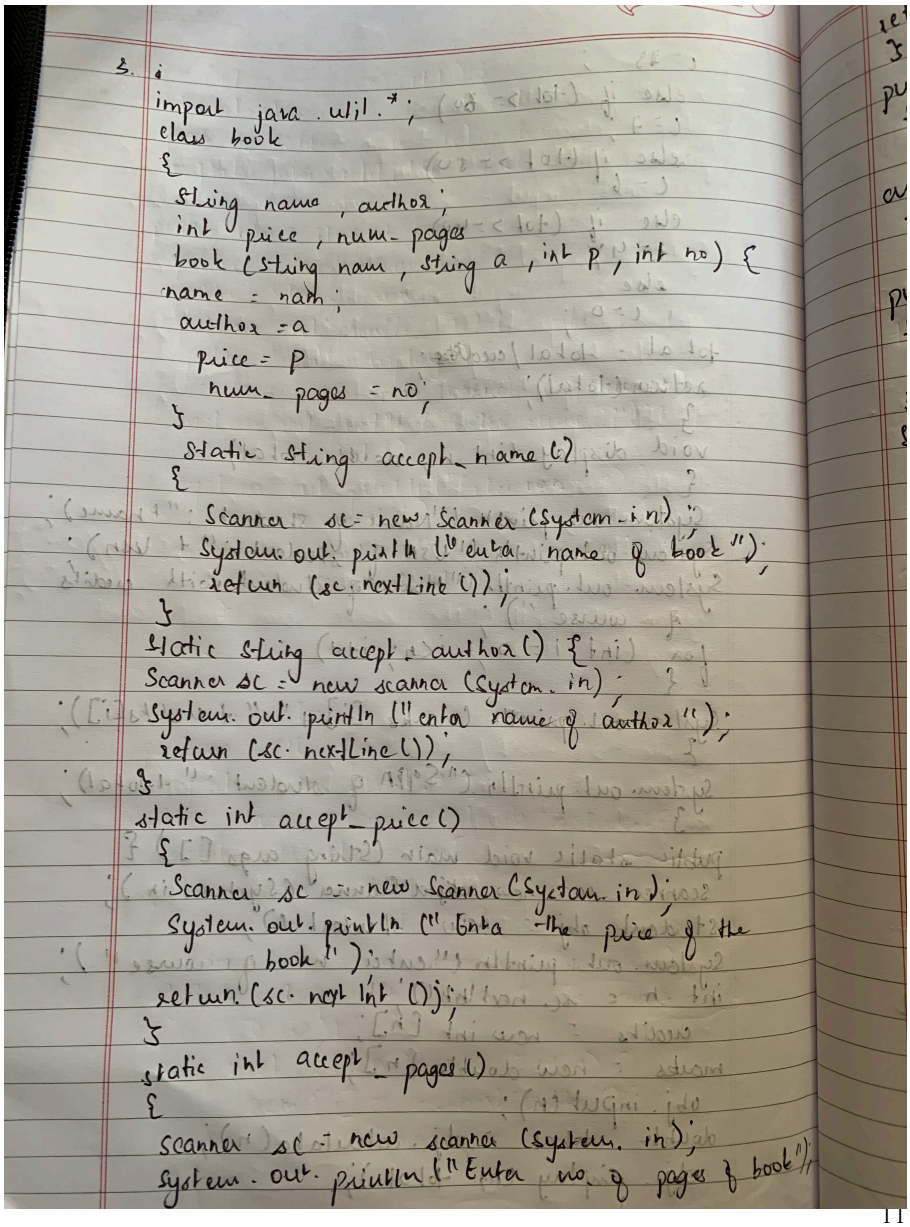
Lab Program - 3

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.

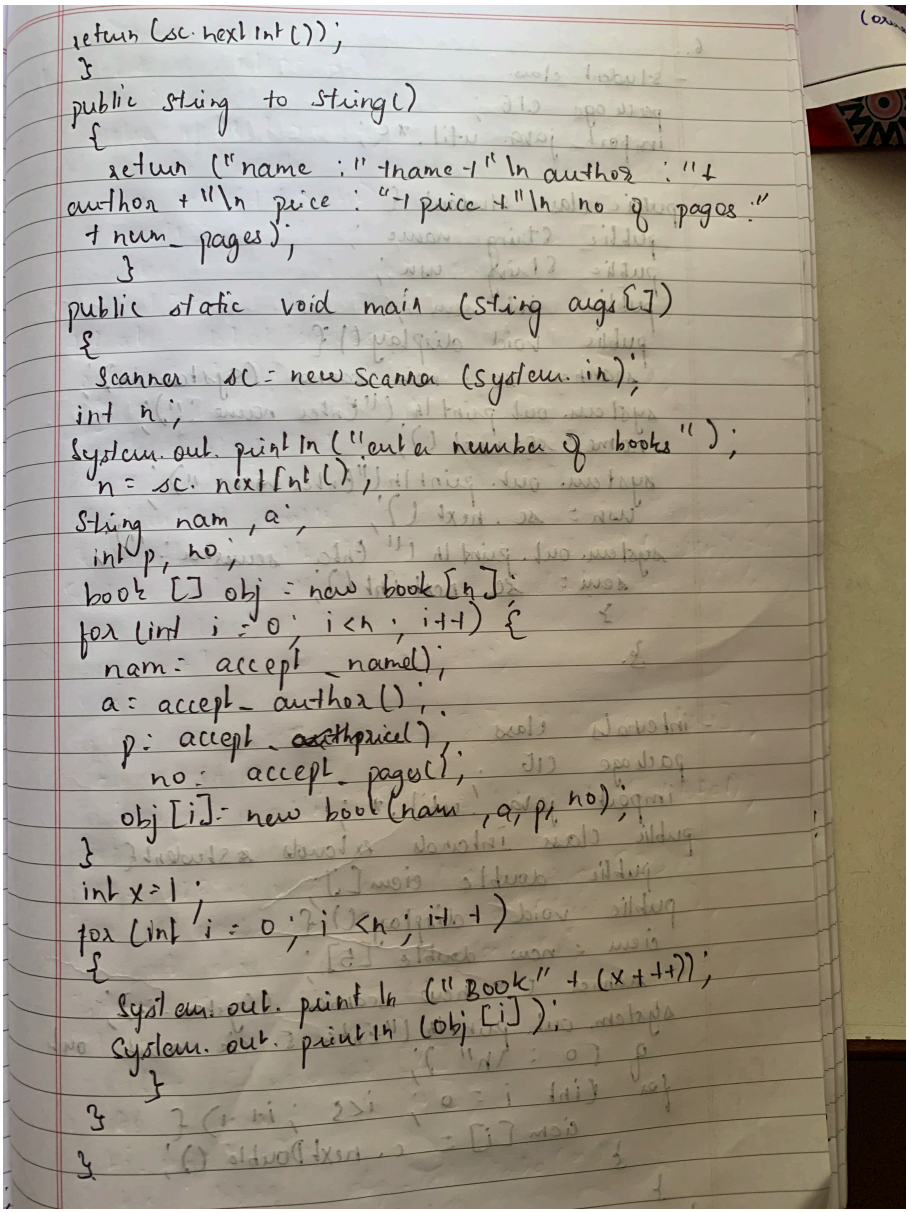
```
import java.util.*;
class book
{
	String name,author;
	int price,num_pages;
	book(String nam,String a,int p,int nno)
	{
		name=nam;
		author=a;
		price=p;
		num_pages=no;
	}
	static String accept_name()
	{
		Scanner sc=new Scanner(System.in);
		System.out.println("enter name of the book");
		return(sc.nextLine());
	}
	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]);
            }

        }
}
```



```
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);
   System.out.println("enter name of book");
   return(sc.nextLine());
  }
  static String accept_author() {
  Scanner sc = new scanner(System.in);
  System.out.println("enter name of author");
   return(sc.nextLine());
  }
  static int accept_price()
  {
   Scanner sc = new Scanner(System.in);
   System.out.println("Enter the 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 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 a number of books");
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]);
  }
}
}
```

```
Last login: Tue Nov 10 07:46:16 on ttys001
Nishchals-MacBook-Pro:~ nishchal$ /var/folders/qg/drk36cks2vb268ql341g9dtr0000gn/T/geany_run_script_NK2ST0.sh ; exit;
enter number of books
3
enter name of the book
asta
enter name of the author
jj thompson
enter price of the book
234
enter no of pages of the book
667
enter name of the book
deteste tous
enter name of the author
lorenzo
enter price of the book
400
enter no of pages of the book
987
enter name of the book
drive
enter name of the author
karter
enter price of the book
600
enter no of pages of the book
765
BOOK 1
name : asta
 author :  jj thompson
 price :  234
 no of pages :  667
BOOK 2
name : deteste tous
 author :  lorenzo
 price :  400
 no of pages :  987
BOOK 3
name : drive
 author :  karter
 price :  600
 no of pages :  765


--------------------
(program exited with code: 0)
Press return to continue
```

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

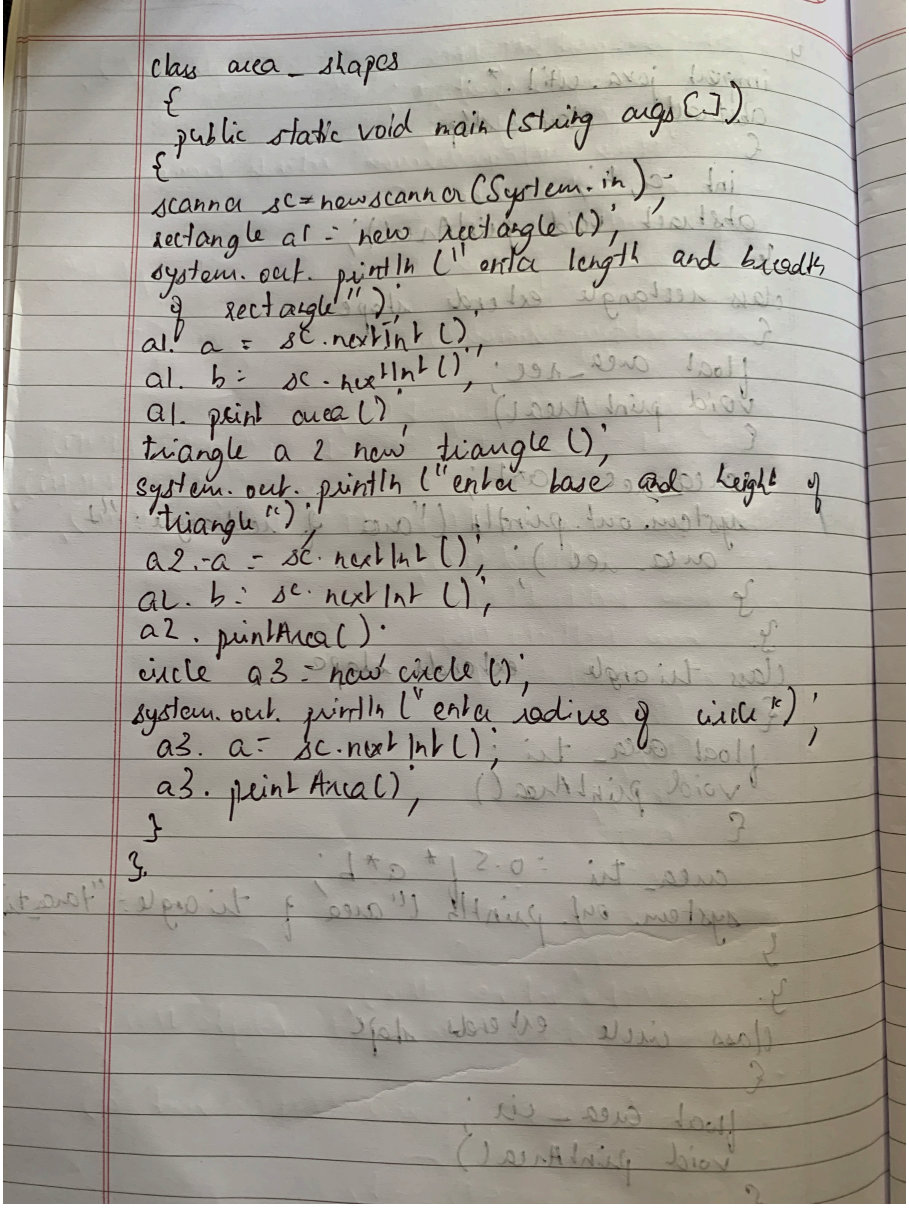
only the method printArea( ) that prints the area of the given shape.

```
/*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();
        }
}
```

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 breadth
of rectangle");
a1. a = sc.nextInt();
a1. b = sc.nextInt();
a1. print area();
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();
}
}
```

```
Desktop — -zsh — 80×24
Last login: Tue Dec 29 12:29:29 on ttys001
nishchal@Nishchals-MacBook-Pro ~ % cd desktop
nishchal@Nishchals-MacBook-Pro desktop % javac shape.java
nishchal@Nishchals-MacBook-Pro desktop % java area_shapes
enter length and breath of rectangle
6
4
area of rectangle = 24.0
enter base and height of triangle
4
5
area of triangle = 10.0
enter radius of circle
4
area of circle = 50.24
nishchal@Nishchals-MacBook-Pro desktop %
```

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");

}
}
```

```
nishchal@Nishchals-MacBook-Pro desktop % javac account.java
nishchal@Nishchals-MacBook-Pro desktop % java bank
enter customer's account type 1.savings account 2.current account
1
-----enter account details-----
enter customer name
nishchal
enter customer account number
18336457
enter customer's account type 1.savings account 2.current account
2
enter customer's balance amount in account
12345
-----customer's account details-----
customer name   nishchal
customer account number 18336457
customer's account type 2
customer's balance amount in account    12345.0
enter 1.deposit 2.withdrawal 3.exit
1
enter amount to be deposited
345
customer's balance amount in account    12690.0
enter 1.deposit 2.withdrawal 3.exit
2
enter amount to be withdrawn
456
customer's balance amount in account    12234.0
enter 1.deposit 2.withdrawal 3.exit
```

Lab Program 6:

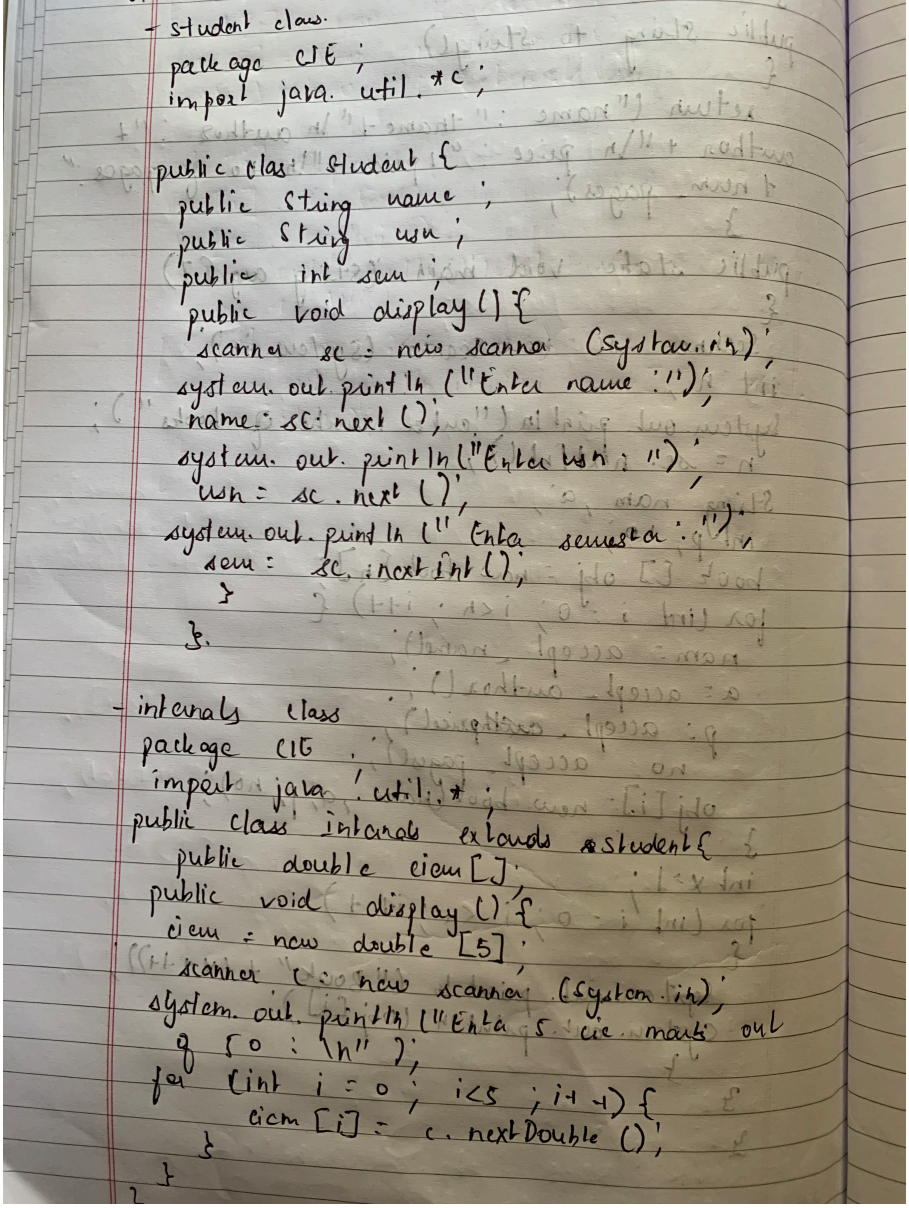
Create a package CIE which has two classes- Student and Internals. The class Personal has members like usn, name, sem. The class Internals has an array that stores the internal marks scored in five courses of the current semester of the student. Create another package SEE which has the class External 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();
                }
        }
}
```

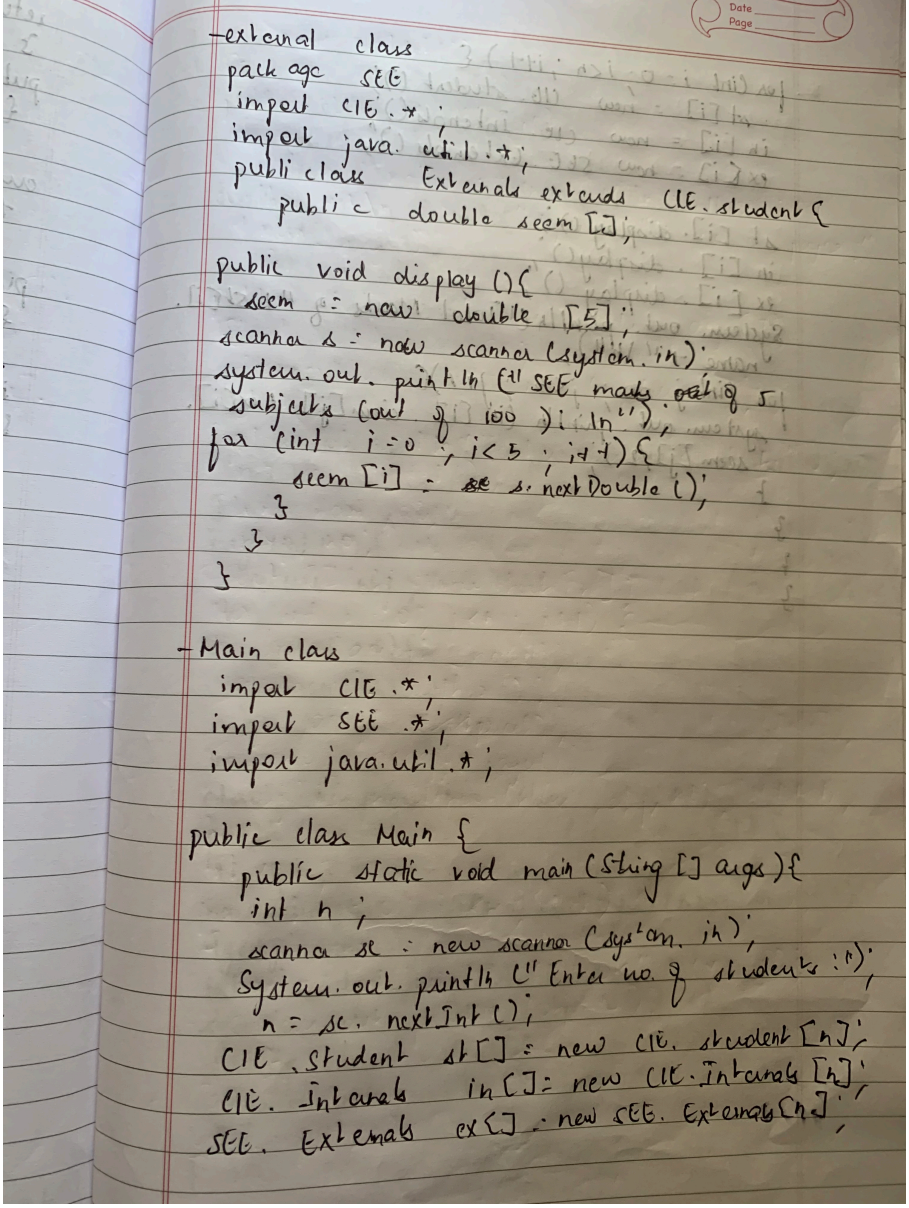


- student class.

```
package CIE;
import java.util.*;

public class Student {
    public String name;
    public String usn;
    public int sem;
    public void display() {
        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 semester:");
        sem = sc.nextInt();
    }
}
```

- internals class

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

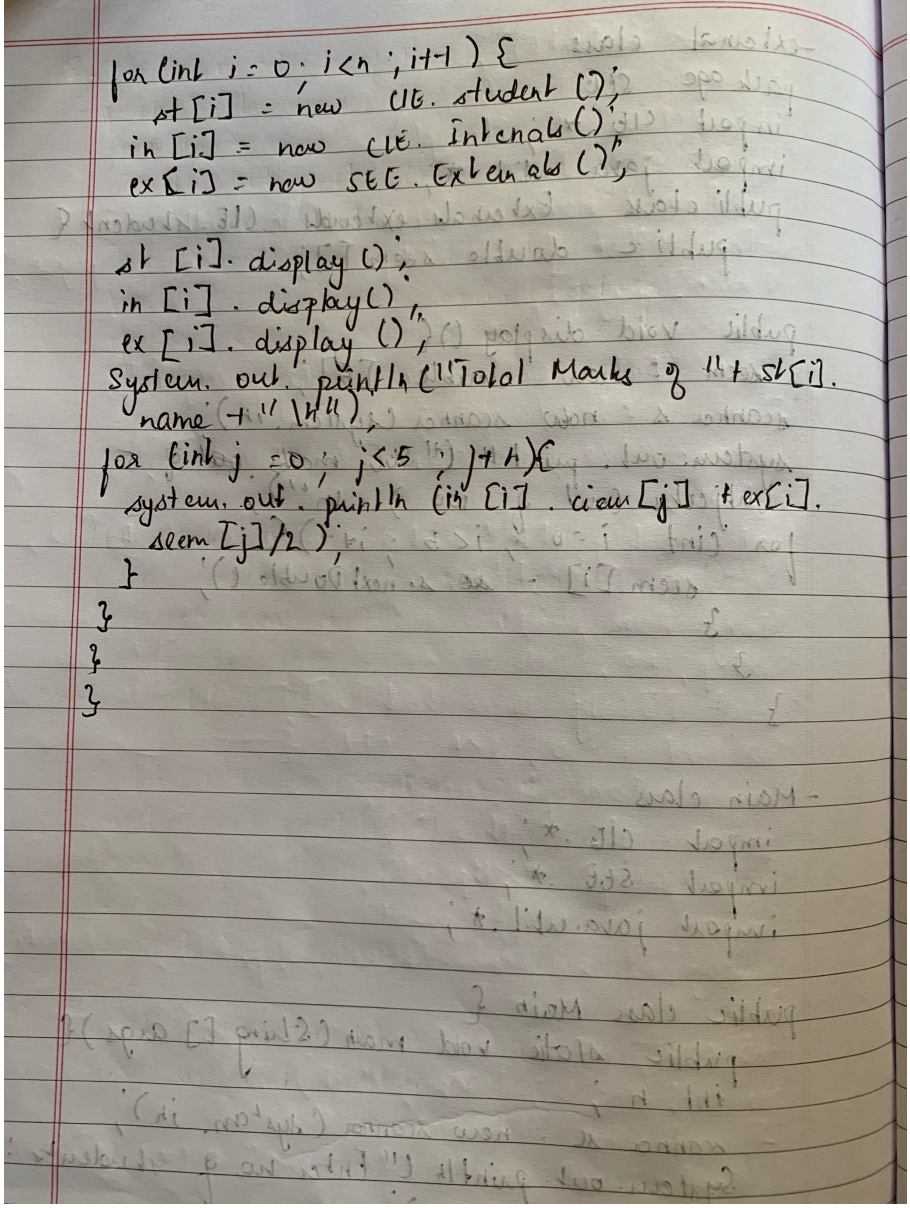


-external class

```
package SEE
import CIE.*;
import java.util.*;
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 of 5
 subjects (out of 100 ):\n");
for(int i=0; i<5; i++){
     seem[i] = s.nextDouble();
   }
  }
}
```

-Main class

```
import CIE.*;
import SEE.*;
import java.util.*;

public class Main {
   public static void main(String[] args){
    int n;
    scanner sc = new scanner(System.in);
    System.out.println("Enter no. of students:");
     n = sc.nextInt();
   CIE.student st[] = new CIE.student[n];
   CIE.Internals in[] = new CIE.Internals[n];
   SEE.Externals ex[] = new SEE.Externals[n];
```



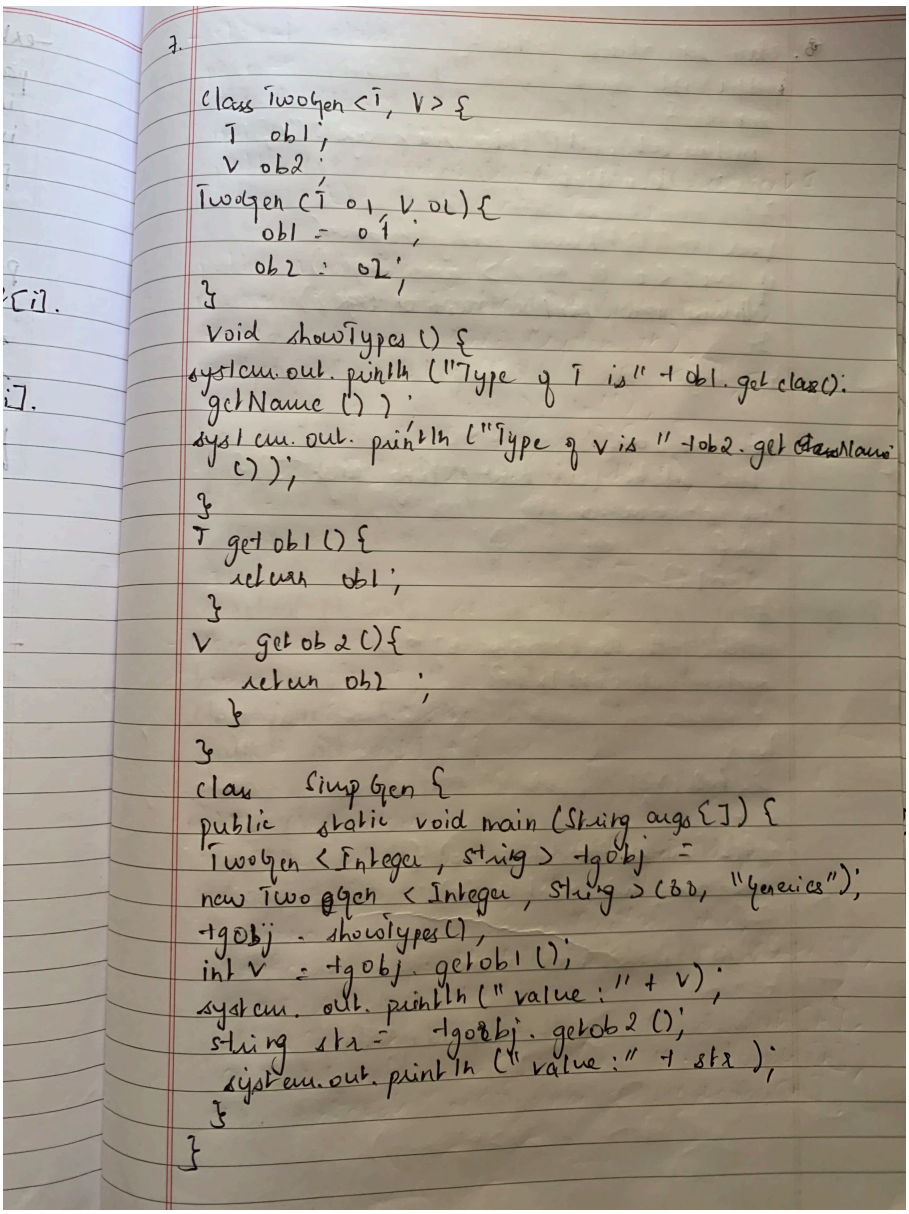
```
for(int i=0; i<n; i++){
    st[i] = new CIE.student();
    in[i] = new CIE.Internals();
    ex[i] = new SEE.External();

    st[i].display();
    in[i].display();
    ex[i].display();
    System.out.println("Total Marks of "+st[i].
    name+"\n");
    for(int j=0; j<5; j++){
    system.out.println(in[i].ciem[j]+ex[i].
    seem[j]/2);
    }
}
}
}
```

```
Nishchals-MacBook-Pro:Week9_LabProgram6 nishchal$ javac Main.java
Nishchals-MacBook-Pro:Week9_LabProgram6 nishchal$ java Main
Enter no. of students:
2
Enter Name:
Nishchal
Enter USN:
1BM19CS105
Enetr Semester:
2
Eneter 5 cie marks out of 50 :

12 32 12 12 32
SEE marks for 5 subjects (out of 100):

89 90 98 76 89
Total Marks of Nishchal

56.5
77.0
61.0
50.0
76.5
Enter Name:
Bob
Enter USN:
1BM19CS007
Enetr Semester:
2
Eneter 5 cie marks out of 50 :

45 43 43 23 21
SEE marks for 5 subjects (out of 100):

78 98 95 43 67
Total Marks of Bob

84.0
92.0
90.5
44.5
54.5
Nishchals-MacBook-Pro:Week9_LabProgram6 nishchal$
```

Lab Program 7:

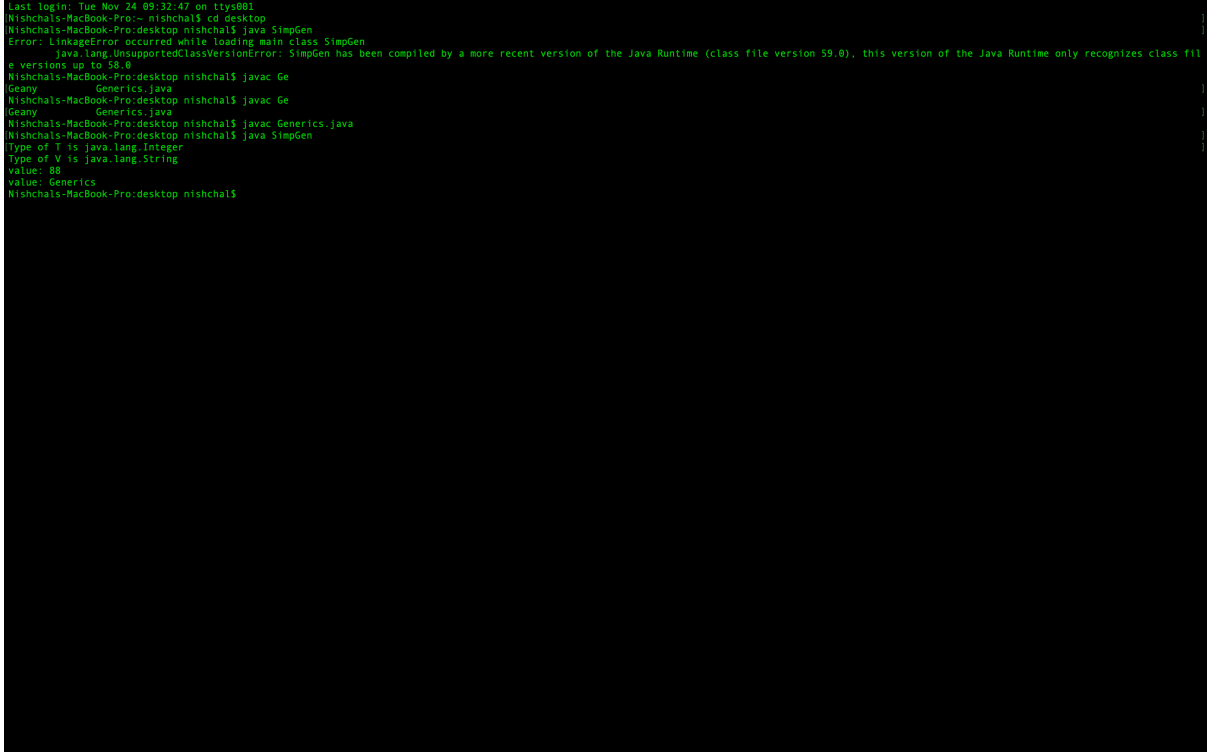
```
class Gen<T1, T2>
{
        T1 ob1;
   T2 ob2;
   Gen(T1 o1, T2 o2)
        {
       ob1 = o1;
       ob2 = o2;
        }

 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);
}
}
```



7.

```
class Twogen<T, V> {
  T ob1;
  V ob2;
Twogen(T o1, V o2){
    ob1 = o1;
    ob2 = o2;
}
void showTypes() {
system.out.println("Type of T is" + ob1.getclass().
getName());
system.out.println("Type of V is " +ob2.getClassName
());
}
T getob1(){
  return ob1;
}
V  getob2(){
   return ob2;
  }
}
class  SimpGen {
public  static void main(String args[]) {
Twogen<Integer, String> tgobj =
new Twogen<Integer, String>(88, "Generics");
tgobj.showTypes();
int v = tgobj.getob1();
system.out.println("value:" + v);
String str = tgobj.getob2();
system.out.println("value:" + str);
}
}
```



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
```

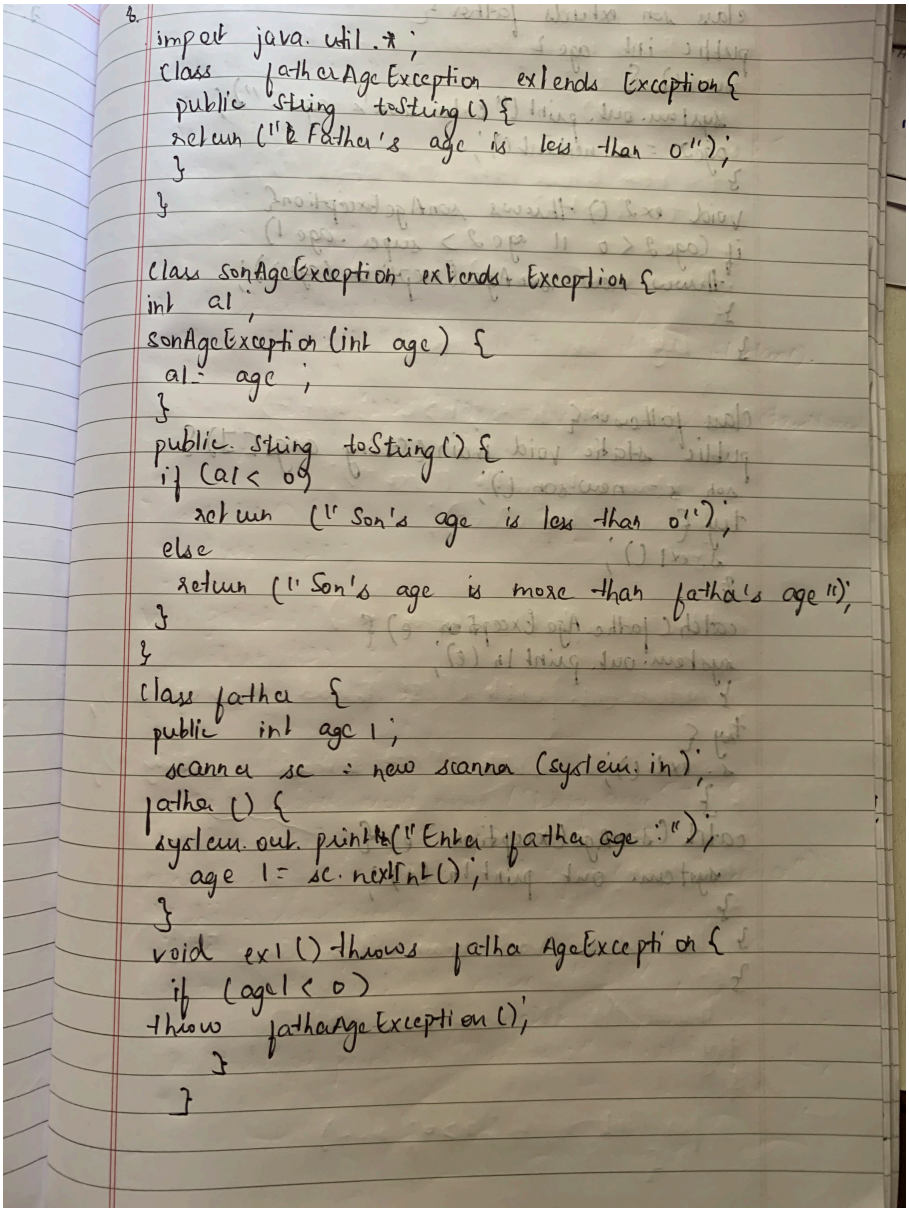
```
{
        int a;
        S_Ex(int age)
        {
                a=age;
        }
        public String toString()
        {
                if(a<0)
                        return ("Son's age is less than 0");
                else
                        return ("Son's age is more than father's age");
        }
}

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)
		{
```

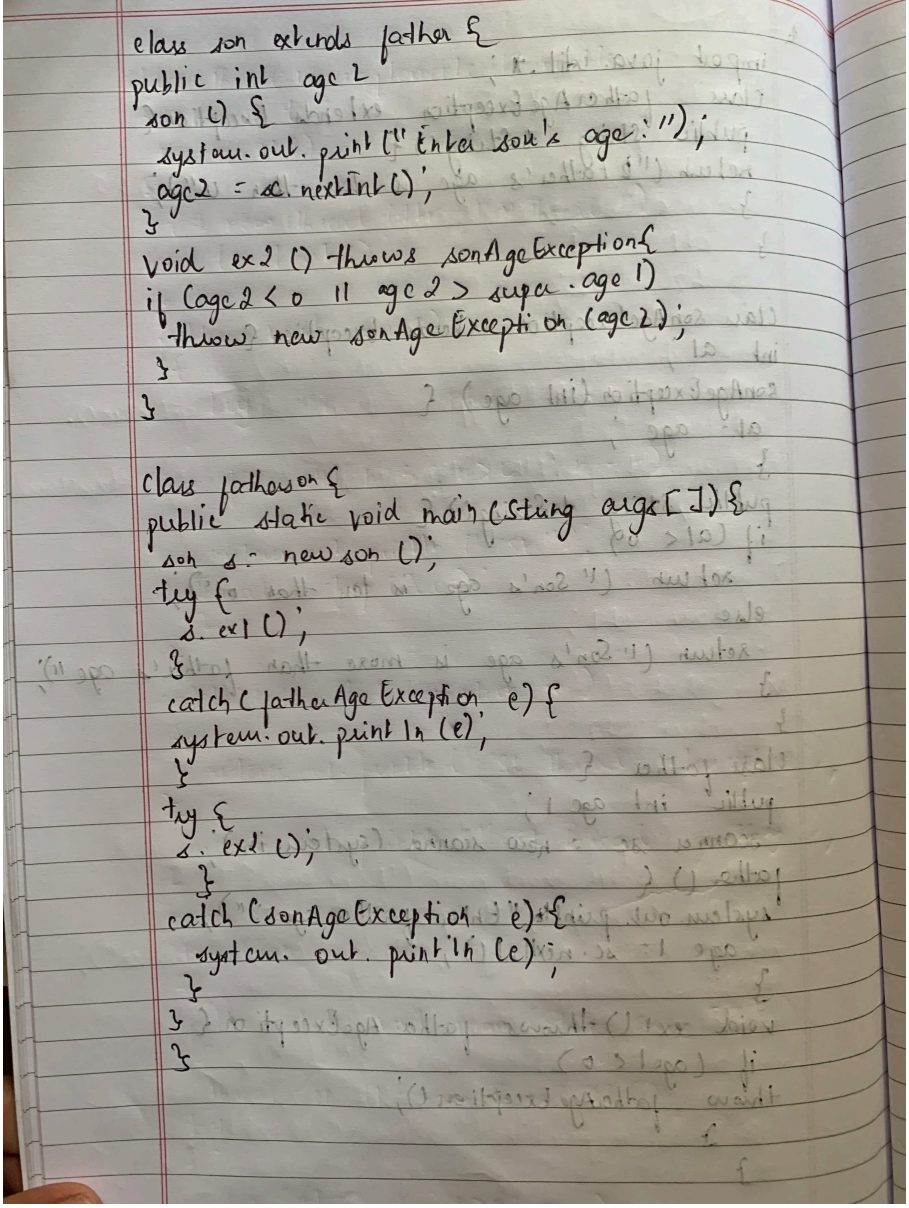
```
                System.out.println(e);
            }
            try
            {
                s.ex2();
            }
            catch(S_Ex e)
            {
                System.out.println(e);
            }
        }
}*/


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");
```

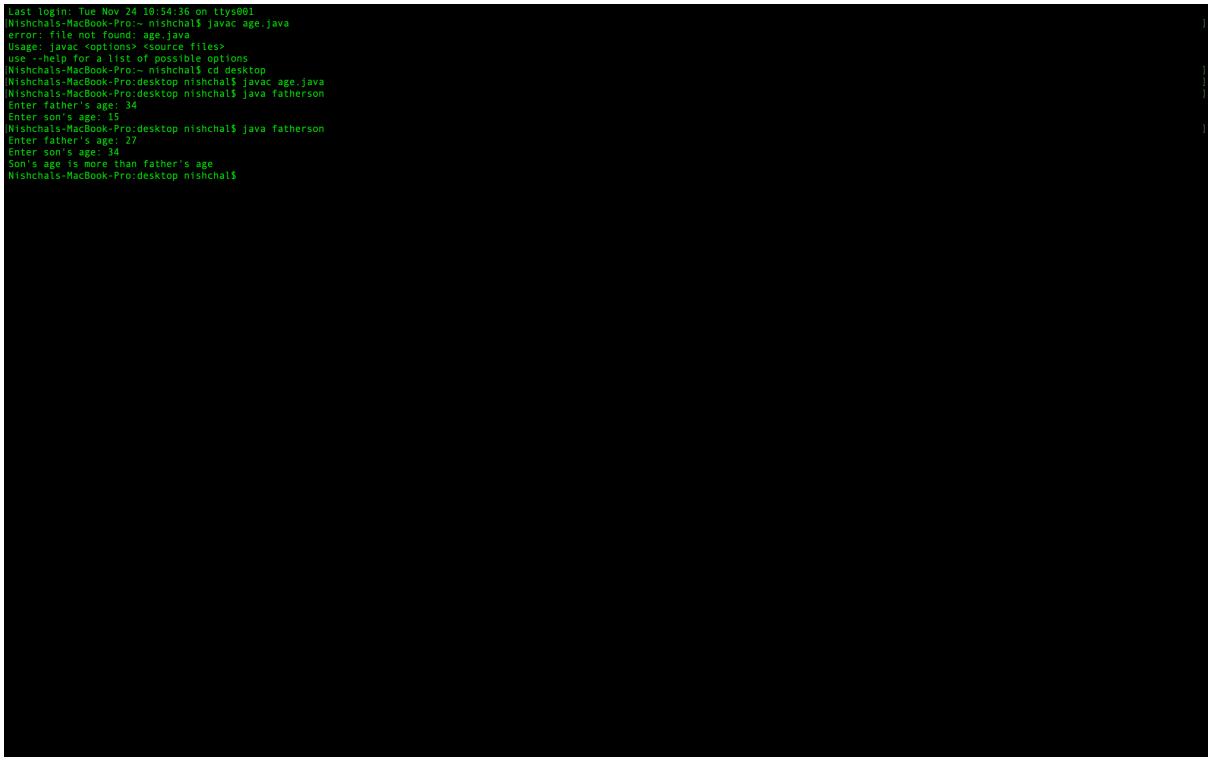
```
        int f=s.nextInt();
        System.out.println("ENTER SON'S AGE");
        int so=s.nextInt();
        son ss=new son(f,so);
        try{
            ss.compute();
        }catch(WrongAge e)
        {
            System.out.println(e);
        }
    }
}
```



```
6.
import java.util.*;
class fathaAgeException extends Exception {
 public String toString() {
 return ("& Fathe's age is less than 0");
 }
}

class sonAgeException extends Exception {
int a1;
sonAgeException(int age) {
 a1 = age;
}
public String toString() {
 if (a1 < 0)
   return ("Son's age is less than 0");
 else
   return ("Son's age is more than fatha's age");
}
}
class fatha {
 public int age1;
  scanner sc = new scanner (system.in);
 fatha() {
 system.out.println("Enter fatha age :");
   age1 = sc.nextInt();
 }
 void ex1() throws fathaAgeException {
  if (age1 < 0)
 throw fathaAgeException();
    }
  }
```

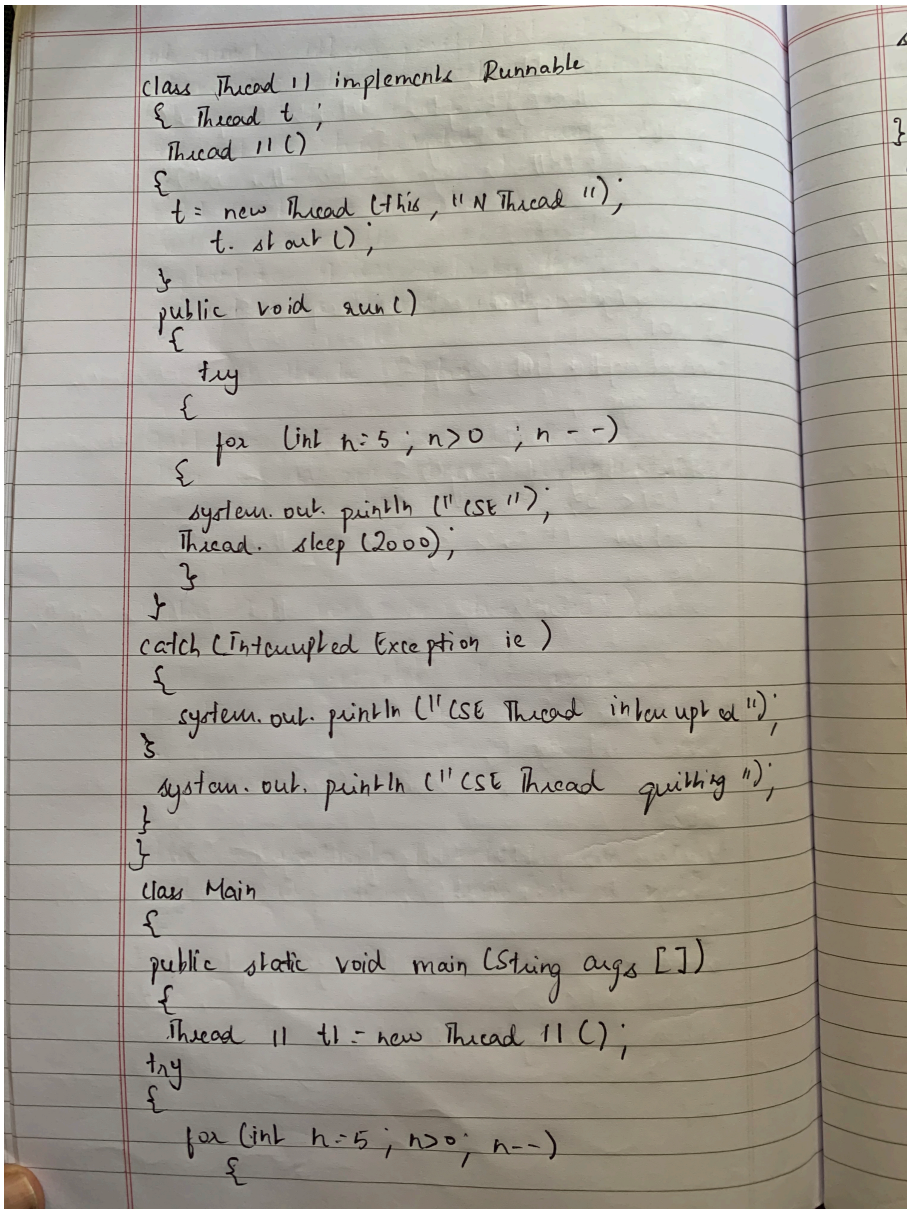


```
class son extends father {
public int age2
son () {
 system.out.print("Enter son's age:");
 age2 = sc.nextInt();
}
Void ex2 () throws sonAgeException{
if (age2 < 0 || age2 > supa.age1)
 throw new sonAgeException (age2);
}
}

class fatherson{
public static void main (String args[]) {
 son s = new son ();
try {
 s.ex1 ();
}
 catch (fatherAgeException e) {
 system.out.println (e);
 }
 try {
 s.ex2 ();
  }
 catch (sonAgeException e){
  system.out.println (e);
 }
}
}
```


Last login: Tue Nov 24 10:54:36 on ttys001
Nishchals-MacBook-Pro:~ nishchal$ javac age.java
error: file not found: age.java
Usage: javac <options> <source files>
use --help for a list of possible options
Nishchals-MacBook-Pro:~ nishchal$ cd desktop
Nishchals-MacBook-Pro:desktop nishchal$ javac age.java
Nishchals-MacBook-Pro:desktop nishchal$ java fatherson
Enter father's age: 34
Enter son's age: 15
Nishchals-MacBook-Pro:desktop nishchal$ java fatherson
Enter father's age: 27
Enter son's age: 34
Son's age is more than father's age
Nishchals-MacBook-Pro:desktop nishchal$

Lab Program 9:

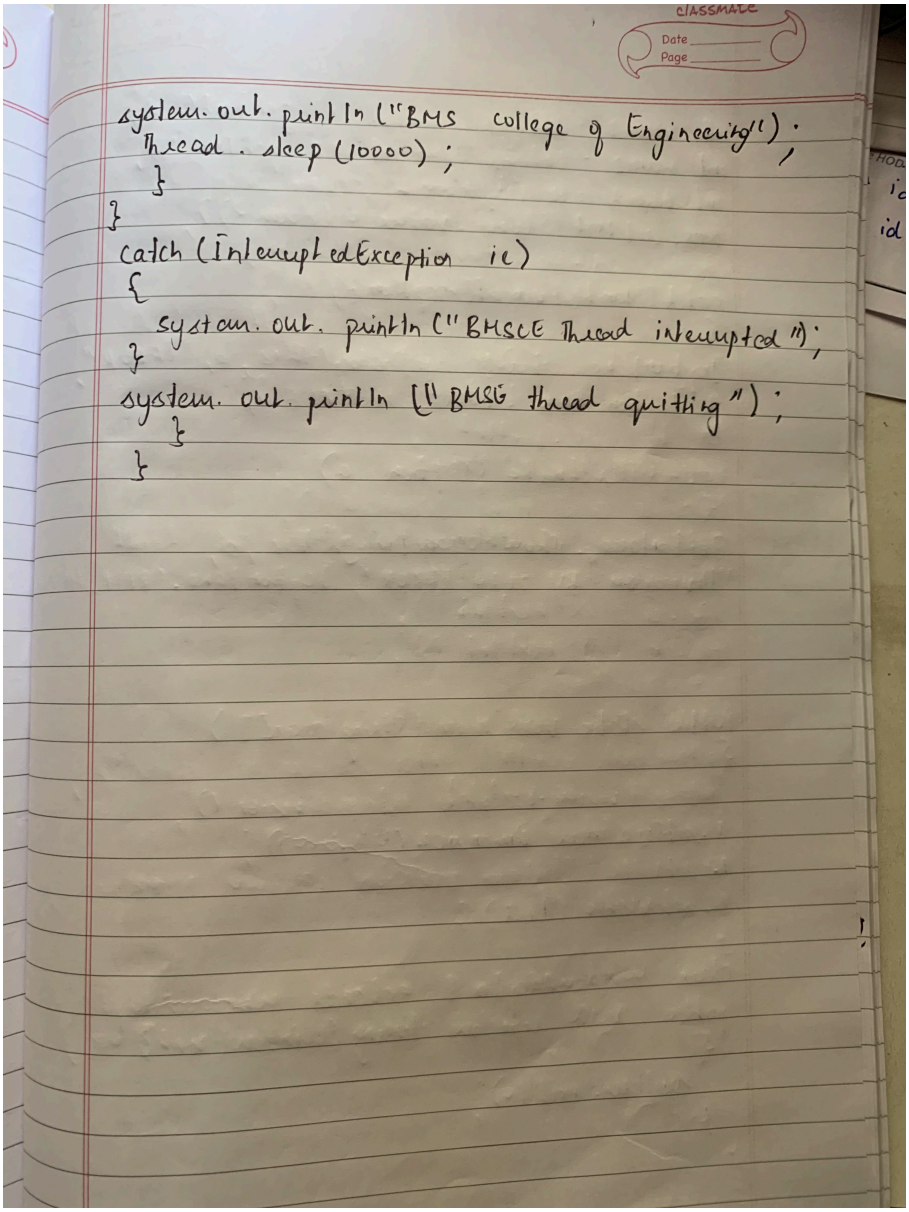
```
class Threads implements Runnable {
    String text;
    Thread t;
    int time;
    Threads(String threadname,int tm) {
    text= threadname;
    time=tm;
    t = new Thread(this, text);
    System.out.println("thread:"+ t);
    t.start();
    }
    public void run() {
    try {
    for(int i = 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);
    }
```



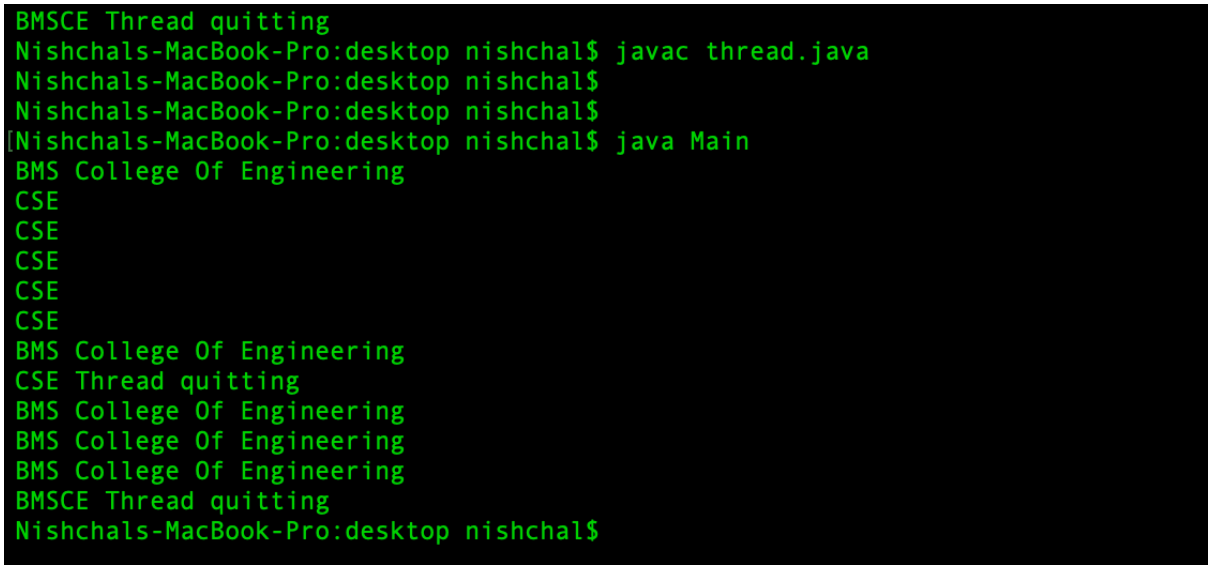
```
class Thread11 implements Runnable
{ Thread t;
 Thread11()
{
 t = new Thread(this, "N Thread");
    t.start();
}
public void run()
 {
   try
  {
    for (int n=5; n>0 ; n--)
  {
   system.out.println("CSE");
   Thread.sleep(2000);
   }
}
catch (Interrupted Exception ie)
 {
   system.out.println("CSE Thread interrupted");
}
 system.out.println("CSE Thread quitting");
}
}
class Main
{
public static void main(String args[])
 {
  Thread11 t1 = new Thread11();
try
{
   for (int n=5; n>0; n--)
     {
```

}

}



```
system.out.println("BMS college of Engineering");
Thread.sleep(10000);
}
}
catch(InterruptedException ie)
{
system.out.println("BMSCE Thread interrupted");
}
system.out.println("BMSG thread quitting");
}
}
```


BMSCE Thread quitting
Nishchals-MacBook-Pro:desktop nishchal$ javac thread.java
Nishchals-MacBook-Pro:desktop nishchal$
Nishchals-MacBook-Pro:desktop nishchal$
Nishchals-MacBook-Pro:desktop nishchal$ java Main
BMS College Of Engineering
CSE
CSE
CSE
CSE
CSE
BMS College Of Engineering
CSE Thread quitting
BMS College Of Engineering
BMS College Of Engineering
BMS College Of Engineering
BMSCE Thread quitting
Nishchals-MacBook-Pro:desktop nishchal$

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

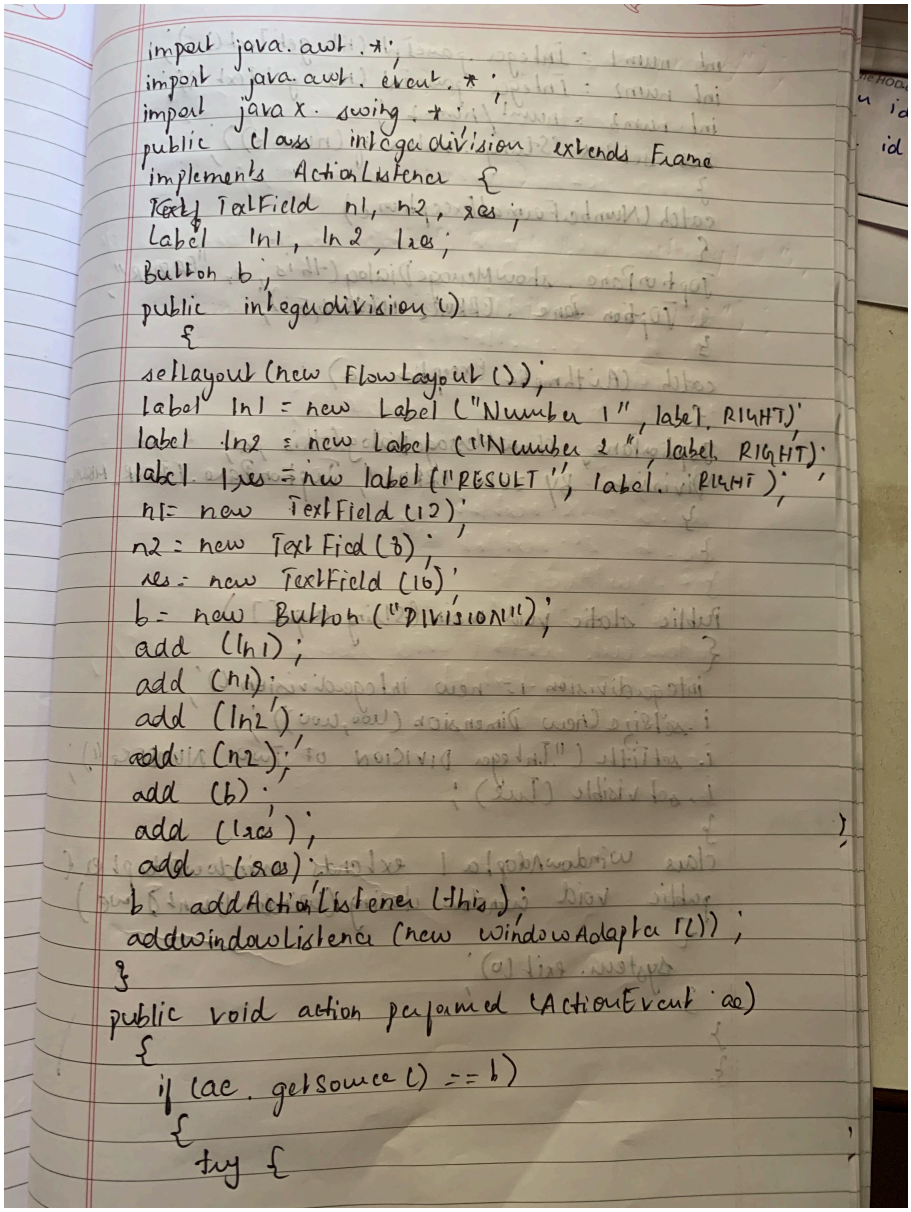
would throw a NumberFormatException. If Num2 were Zero, the program would throw an

Arithmetic Exception Display the exception in a message dialog box.*/

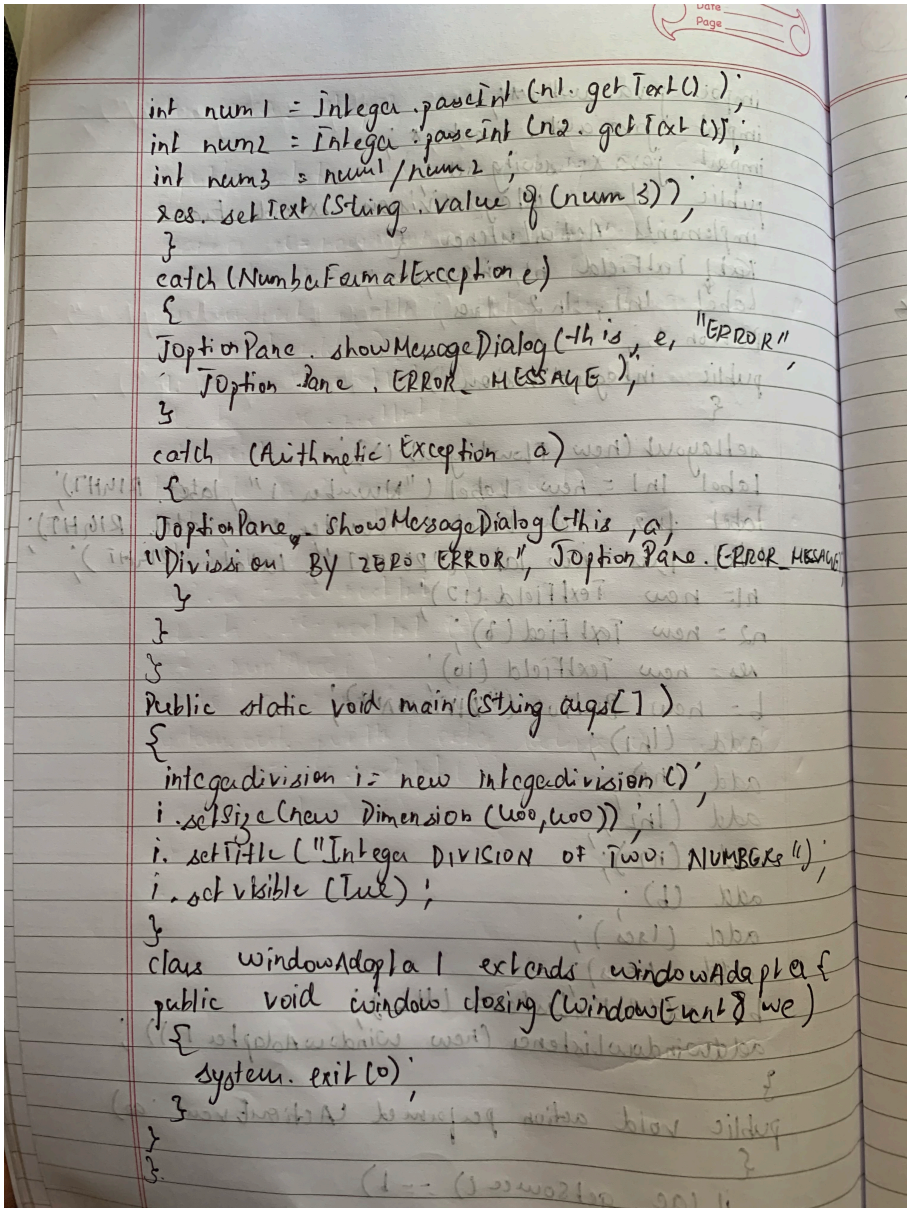
```
import java.awt.*;
import java.awt.event.*;
import javax.swing.*;
public class integerdivision extends Frame implements ActionListener
{
   TextField n1,n2,res;
   Label ln1,ln2,lres;
   Button b;
   public integerdivision()
        {
      setLayout(new FlowLayout());
      Label ln1=new Label("NUMBER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

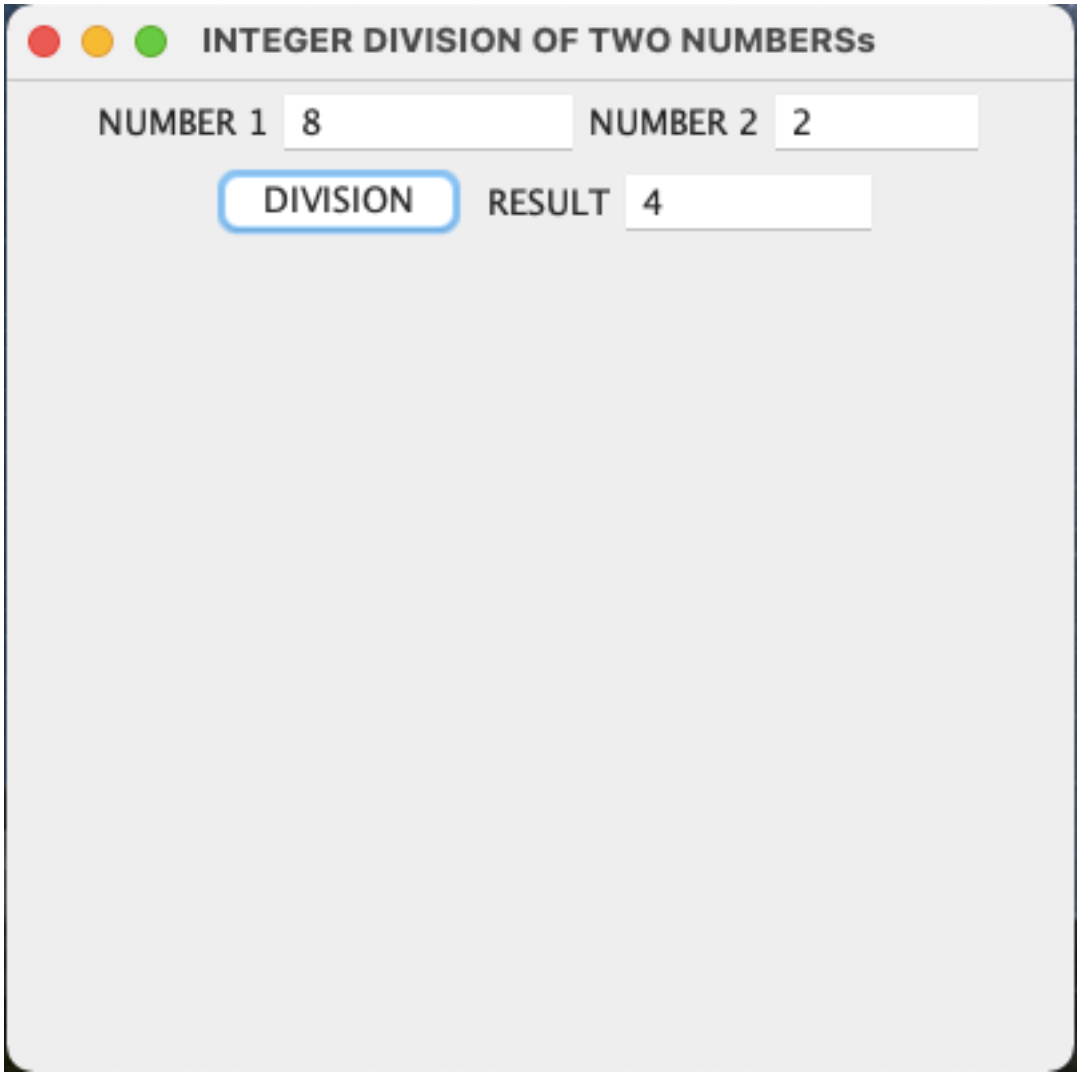
```
public static void main(String args[])
{
    integerdivision i=new integerdivision();
    i.setSize(new Dimension(400,400));
    i.setTitle("INTEGER DIVISION OF TWO NUMBERSs");
    i.setVisible(true);
}

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

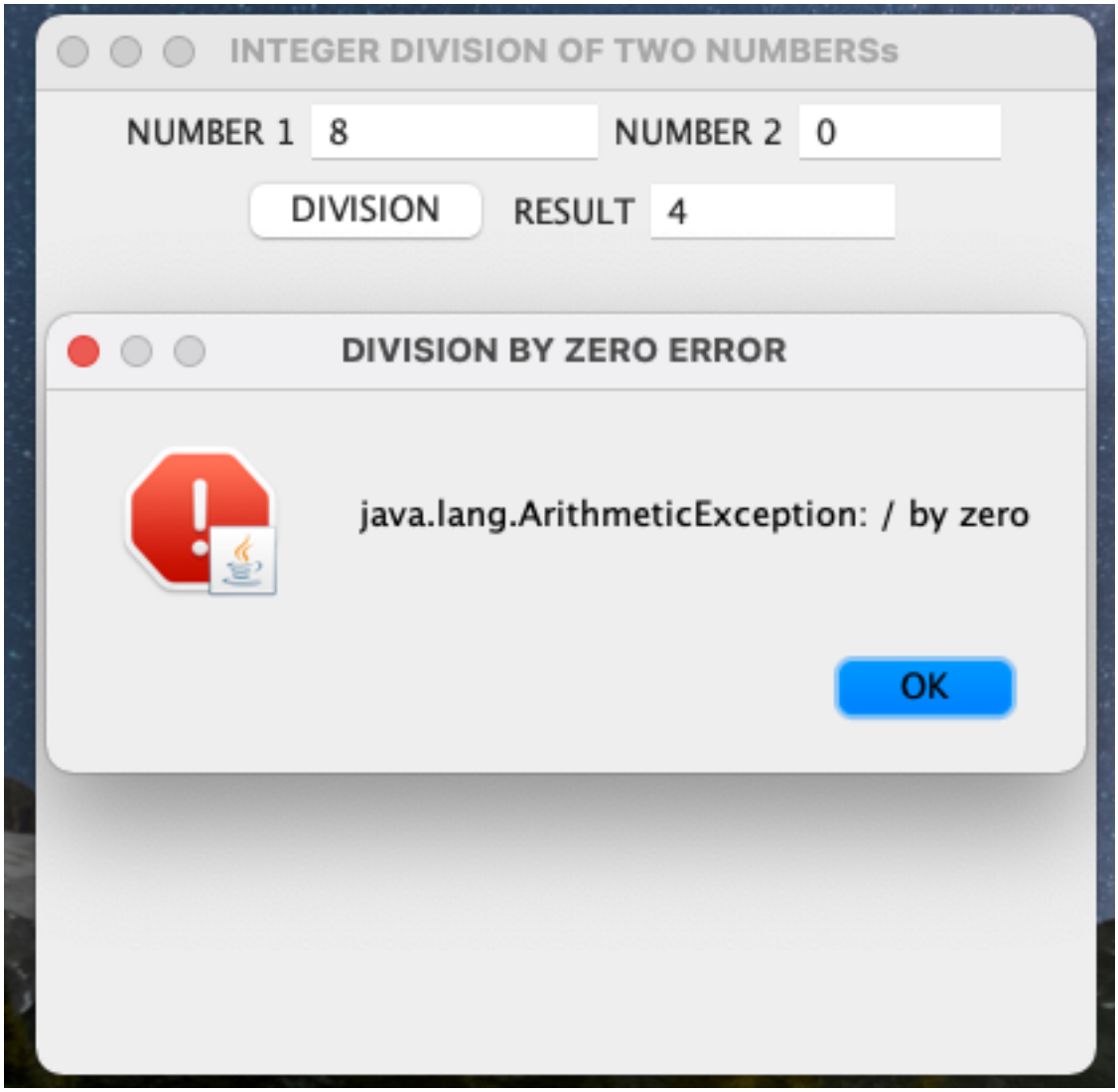


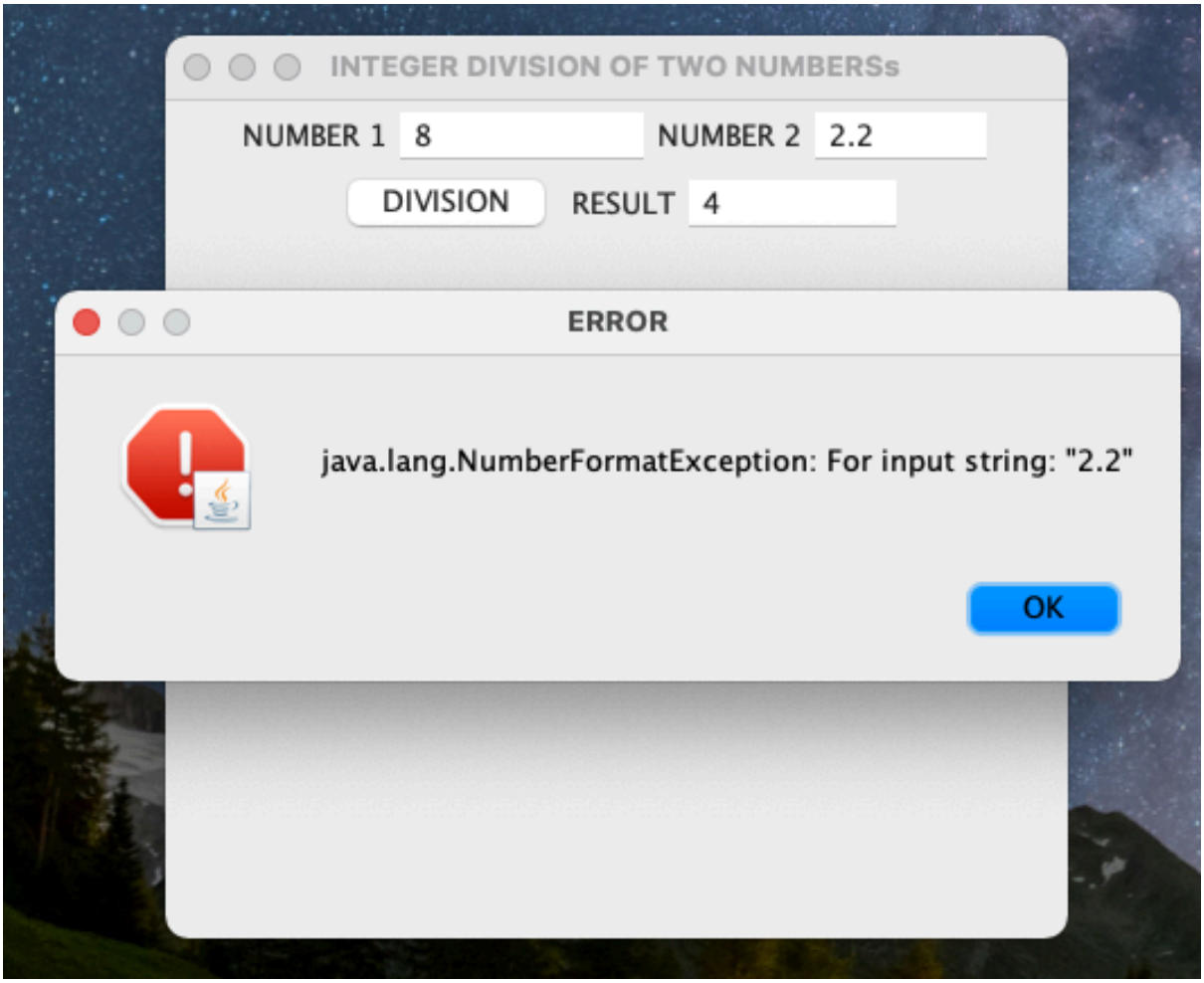
```
import java.awt.*;
import java.awt.event.*;
import javax.swing.*;
public class integerdivision extends Frame
implements ActionListener {
TextField n1, n2, res;
Label ln1, ln2, lres;
Button b;
public integerdivision()
  {
setLayout(new FlowLayout());
Label ln1 = new Label("Number 1", label.RIGHT);
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(16);
b = new Button("DIVISION");
add(ln1);
add(n1);
add(ln2);
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 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 NUMBERS");
i.setVisible(true);
}
class windowAdapter extends windowAdapter{
public void windowClosing(WindowEvent we)
{
System.exit(0);
}
}
```


INTEGER DIVISION OF TWO NUMBERSs
NUMBER 1
8
NUMBER 2
2
DIVISION
RESULT
4


INTEGER DIVISION OF TWO NUMBERSs
NUMBER 1
8
NUMBER 2
0
DIVISION
RESULT
4
DIVISION BY ZERO ERROR
java.lang.ArithmeticException: / by zero
OK


INTEGER DIVISION OF TWO NUMBERSs
NUMBER 1
8
NUMBER 2
2.2
DIVISION
RESULT
4
ERROR
java.lang.NumberFormatException: For input string: "2.2"
OK