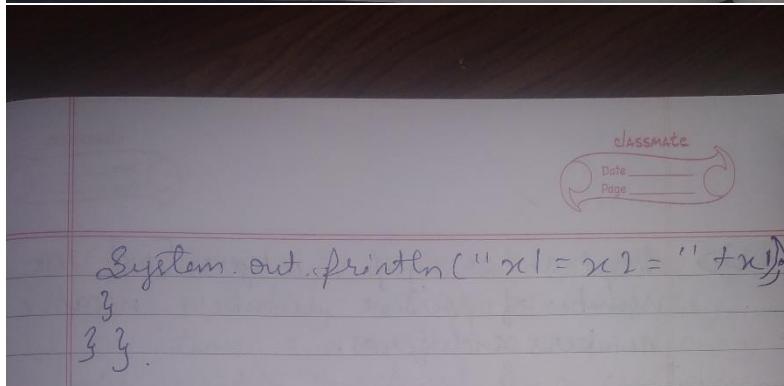
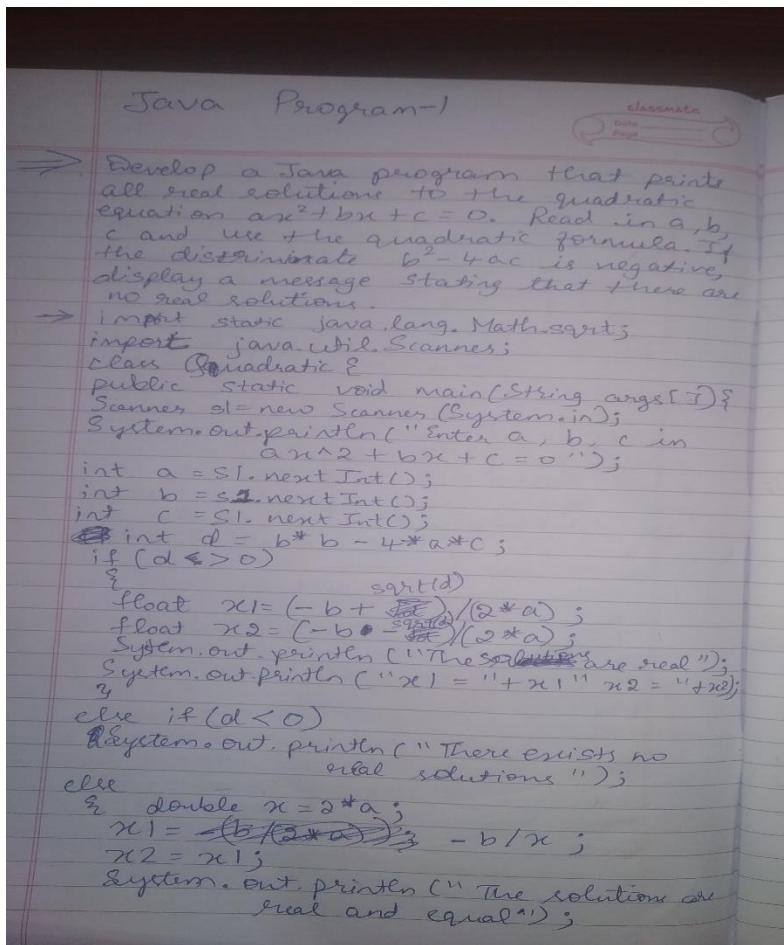


1)

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.



```

C:\Program Files\Java\bin\basic>1_quadratic.java
C:\Program Files\Java\bin\basic>java Quadratic
Enter a, b and c in ax^2+bx+c=0
3
1
1
There exists no real solutions

C:\Program Files\Java\bin\basic>java Quadratic
Enter a, b and c in ax^2+bx+c=0
1
4
2
The solutions are real
x1=-0.5858
x2=-3.4142

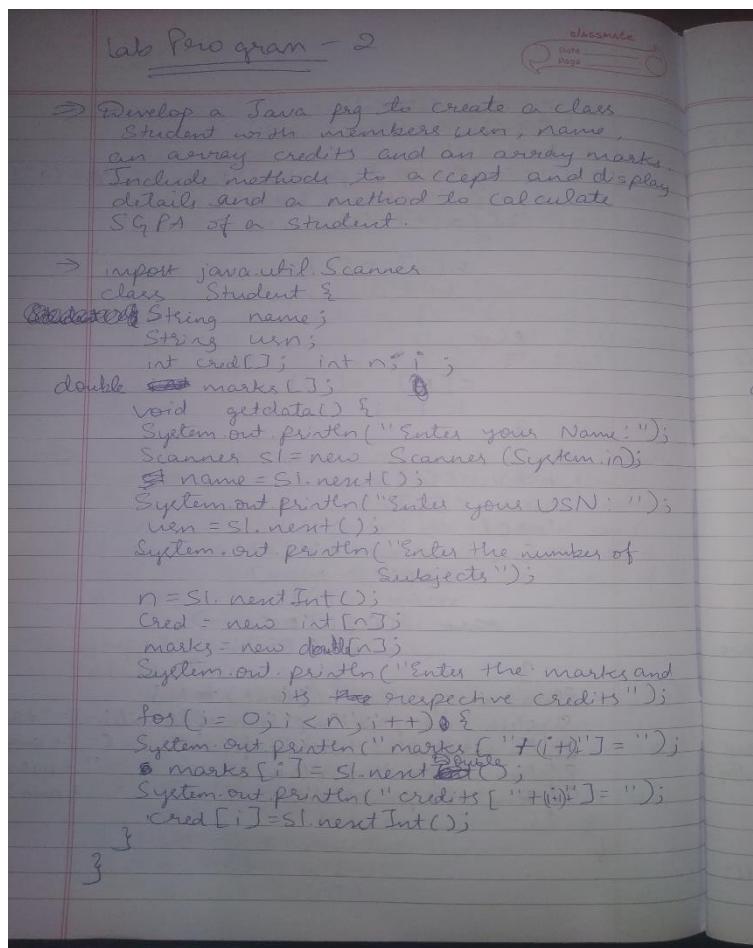
C:\Program Files\Java\bin\basic>java Quadratic
Enter a, b and c in ax^2+bx+c=0
1
2
1
The solutions are real and equal
x1=x2=-1.0

```

2)

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.



```

classmate
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Page _____

```

```

void printdata() {
    System.out.println("Name: " + name);
    System.out.println("USN: " + usn);
    System.out.println("Marks and its
        respective credits");
    for (i = 0; i < n; i++) {
        System.out.println("Subject " + (i + 1) + "- Marks
            - " + marks[i] + " Credits - "
            + cred[i]);
    }
}

void calc() {
    double sum = 0; int cre = 0;
    double float sgpa; int GP = new int[n + 1];
    for (i = 0; i < n; i++) {
        if (marks[i] >= 90)
            GP[i] = 10;
        else if (marks[i] >= 80 & marks[i] < 90)
            GP[i] = 9;
        else if (marks[i] >= 70 & marks[i] < 80)
            GP[i] = 8;
        else if (marks[i] >= 60 & marks[i] < 70)
            GP[i] = 7;
        else if (marks[i] >= 50 & marks[i] < 60)
            GP[i] = 6;
        else
            GP[i] = 5;
        sum = (double)(cred[i] * GP[i])
            + sum;
        int cre = cred[i] + cre;
    }
    sgpa = sum / cre;
    System.out.println("SGPA = " + sgpa);
    System.out.printf("SGPA = %.2f", sgpa);
}

```

```

classmate
Date _____
Page _____

```

```

class StudentMain {
    public static void main(String args[]) {
        Student SS = new Student();
        SS.getData();
        SS.printdata();
        SS.calc();
    }
}

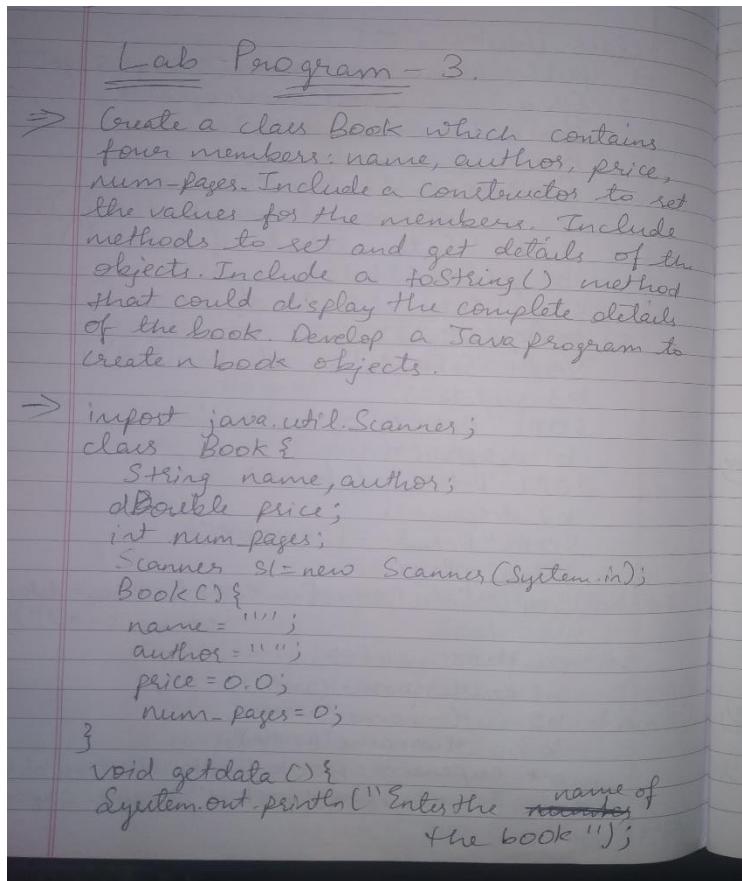
```

```
C:\Program Files\Java\bin\basic>javac student_sgpa.java
C:\Program Files\Java\bin\basic>java StudentMain
Enter your name
Harshitha
Enter your USN
1bm19cs059
Enter the number of subjects
3
Enter your marks and its respective credits
marks[1]=
34
credits[1]=
3
marks[2]=
45
credits[2]=
3
marks[3]=
50
credits[3]=
5
Name:Harshitha
USN:1bm19cs059
Subject 1-Marks=34.0;Credits=3
Subject 2-Marks=45.0;Credits=3
Subject 3-Marks=50.0;Credits=5
SGPA=5.45
C:\Program Files\Java\bin\basic>
```

3)

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.



classmate
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```

name = sc.nextInt();
System.out.println("Enter the name of the
author = sc.nextInt();
System.out.println("Enter the price of the
book");
price = sc.nextDouble();
System.out.println("Enter the number of
pages");
numPages = sc.nextInt();

public String toString() {
    return ("Book name: " + name +
        " Author: " + author + " Price
        : " + price + " No. of pages: "
        + numPages);
}

class BookMain {
    public static void main(String args[]) {
        Scanner sc = new Scanner(System.in);
        System.out.println("Enter the number of
books");
        int n = sc.nextInt();
        Book b[] = new Book[n];
        for(int i=0; i<n; i++) {
            b[i] = new Book();
            System.out.println("Enter the details
of the book " + (i+1));
            b[i] = getData();
        }
        for(i=0; i<n; i++) {
            System.out.println("Details of book " + (i+1));
            System.out.println(b[i]);
        }
    }
}

```

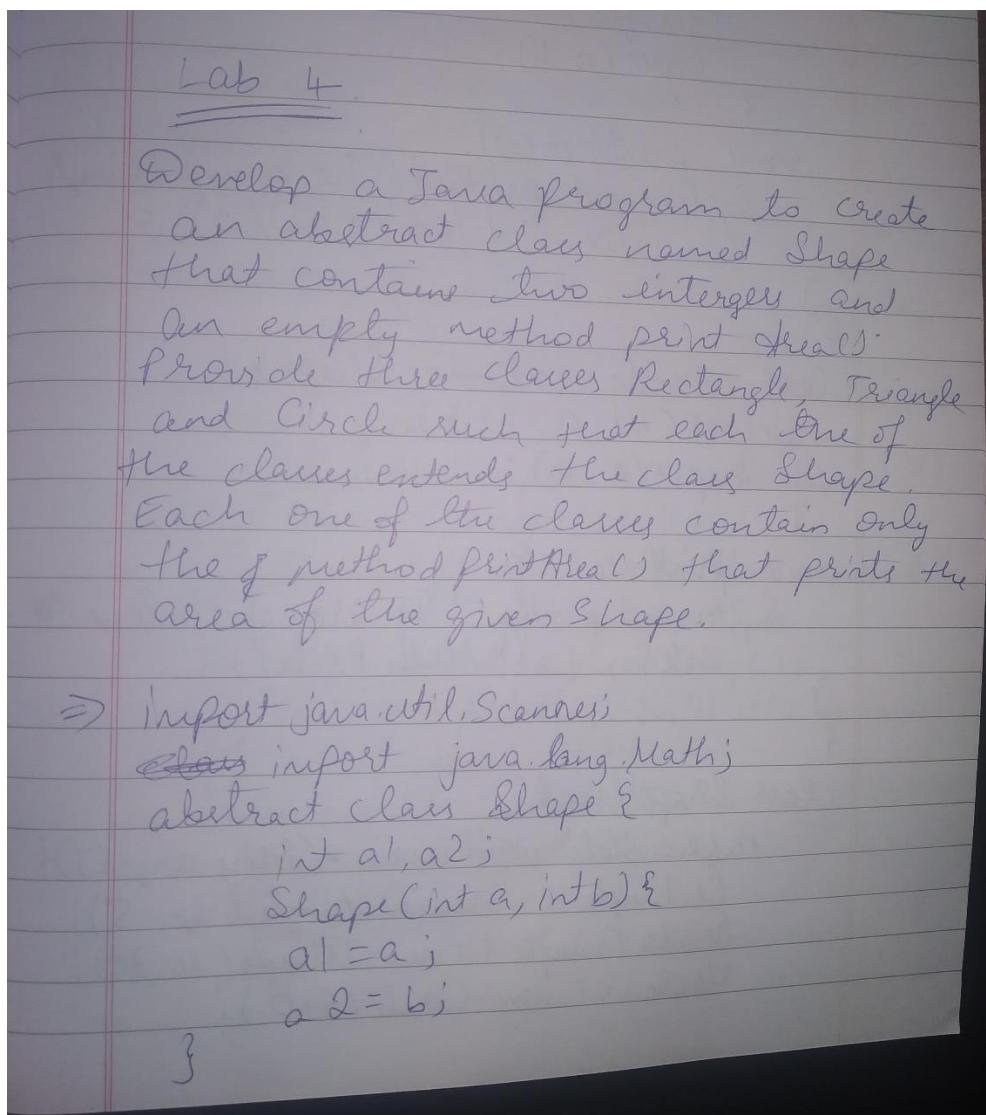
```

C:\Program Files\Java\bin\basic>java BooksMain
Enter the number of books
2
Enter the Details of book 1
Enter the name of the book
Chemistry
Enter the name of the author
Shyam
Enter the price of the book
345
Enter the number of pages
234
Enter the Details of book 2
Enter the name of the book
Physics
Enter the name of the author
Raman
Enter the price of the book
648
Enter the number of pages
212
Details of the book 1
book name:Chemistry author:Shyam price:345.0 number of pages:234
Details of the book 2
book name:Physics author:Raman price:648.0 number of pages:212
C:\Program Files\Java\bin\basic>

```

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.



classmate
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Page _____

```

abstract void printArea();
class Rectangle extends Shape {
    Rectangle(int a, int b) {
        Super(a, b);
    }
    void printArea() {
        System.out.println("The area of rectangle is : " + (a1 * a2));
    }
}
class Triangle extends Shape {
    Triangle(int a, int b) {
        Super(a, b);
    }
    void printArea() {
        System.out.println("The area of triangle is : " + ((a1 * a2) / 2));
    }
}
class Circle extends Shape {
    Circle(int a, int b) {
        Super(a, a);
    }
    void printArea() {
        System.out.println("The area of circle is : " + (a1 * a1) * Math.PI);
    }
}

class ShapeMain {
    public static void main(String args[]) {
        Rectangle r = new Rectangle(4, 5);
        Rectangle t = new Triangle(20, 30);
        Circle c = new Circle(5.0);
    }
}

```

class
Date _____
Page _____

```

r.printArea();
t.printArea();
c.printArea();

```

```
C:\Program Files\Java\bin\basic>javac abstractclass.java
C:\Program Files\Java\bin\basic>java ShapeMain
The area of rectangle is:200
The area of triangle is:300
The area of circle is: 78.54
C:\Program Files\Java\bin\basic>
```

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

Lab - 5

Bank Inheritance.

```
import java.util.Scanner;
class Account {
    String cust_name, type;
    long account_num;
    double balance;
    boolean check_book;
    static double min = 500.0, servicecharge
                      = 100;
    Scanner ss=new Scanner(System.in);
    void getdata() {
        System.out.println("Enter name:");
        cust_name=ss.nextLine();
        System.out.println("Enter the account
                           number:");
        account_num=ss.nextInt();
        System.out.println("Enter the balance
                           amount:");
        balance=ss.nextDouble();
    }
    void display() {
        System.out.println("Customer name: "
                           + cust_name);
```

System.out.println("Account number : " +
account_num);
System.out.println("Current Balance : " +
+ account_balance);

9

3
Class Savings extends Account {
double interest_rate = 0.03, withdraw,

int n, time;
Scanner ss = new Scanner(System.in);

void calc_interest() {

System.out.println("Enter the time
in years : ");

time = ss.nextInt();
System.out.println("Enter the number
of times the interest is to be
compounded : ");

n = ss.nextInt();

interest = balance * (Math.pow((1 + rate(n))
, time * n));

balance += interest;

System.out.println("The interest amount
is : " + interest);

System.out.println("The balance after
calculating interest is : " + balance);

3
void withdrawal() {

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

withdrawal_amt = ss.nextDouble();
if (balance > withdrawal_amt)

balance -= withdrawal_amt;

else

System.out.println("Balance")

```

class BankMain {
    public static void main(String args) {
        int type;
        Savings s = new Savings();
        Current c = new Current();
        Scanner ss = new Scanner(System.in);
        System.out.println("Enter the type of account");
        System.out.println("1 for savings & 2 for Current:");
        type = ss.nextInt();
        if(type == 1) {
            int withdraw = 0;
            s.getdata();
            s.display();
            s.calInterest();
            System.out.print("Would you like to withdraw money from your savings account? ");
            System.out.println("Enter 1 if yes and 2 if no");
            withdraw = ss.nextInt();
            if(withdraw == 1) {
                s.withdrawal();
                s.penalty();
            }
        } else if(type == 2) {
            int deposit = 0;
            c.getdata();
            c.display();
            System.out.println("Enter 1 to deposit & 2 if no");
            deposit += ss.nextInt();
            if(deposit == 1) {
                c.deposit();
                c.penalty();
            }
        }
    }
}

```

```

C:\Program Files\Java\bin\basic>javac personih.java
C:\Program Files\Java\bin\basic>java Personmain
Enter e if you're an employee and s if you're a student:
e
Enter 1 if you're a teaching staff and 2 if you're a non teaching staff:
1
Enter your name:
harshitha
Enter your age:
40
Enter your ID:
bs12
Enter your salary:
50000
Enter the subject you teach:
computer science
Name:harshitha
Age:40
ID:bs12
Salary:50000.0
Subject teaching:computer science

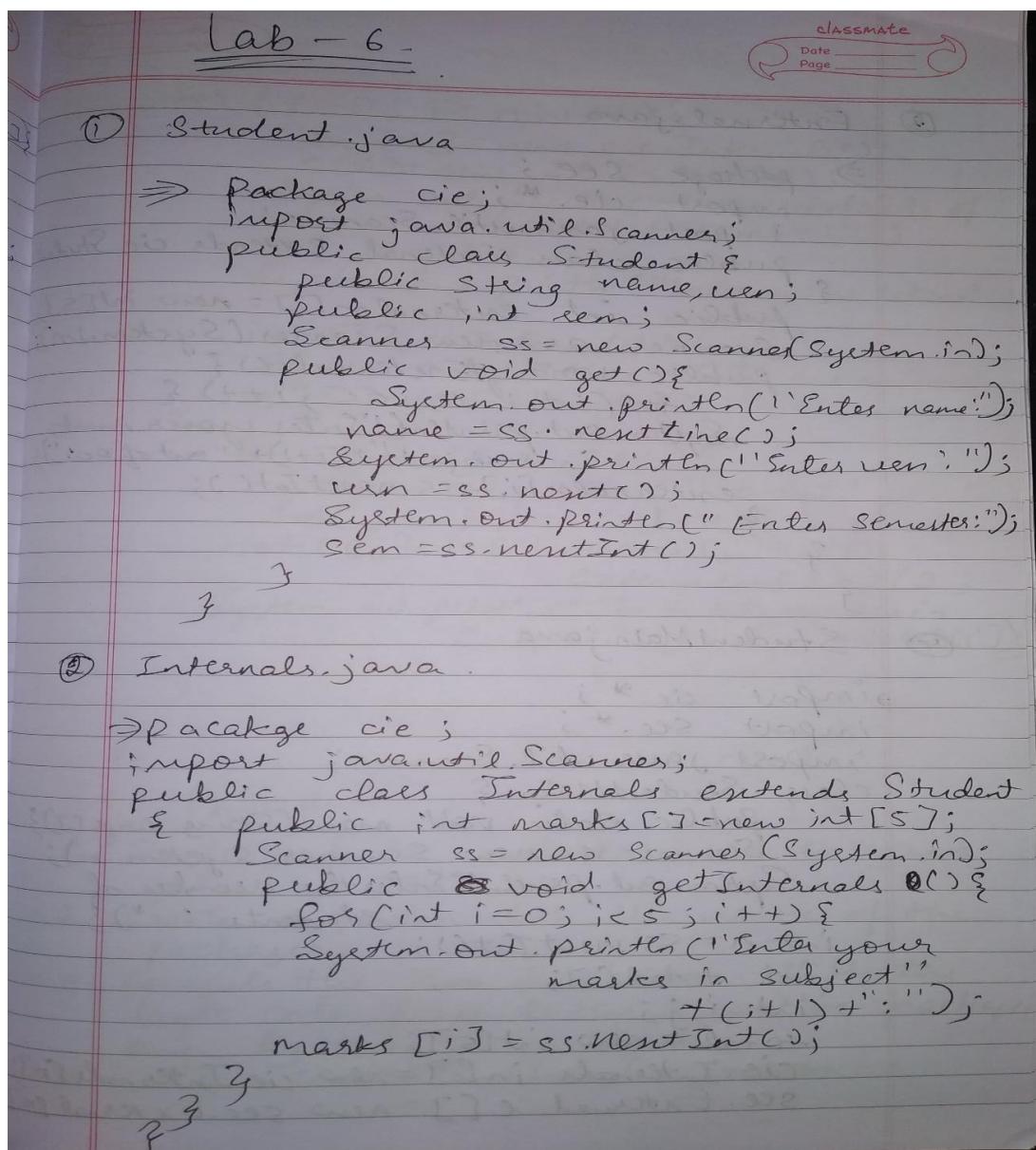
C:\Program Files\Java\bin\basic>java Personmain
Enter e if you're an employee and s if you're a student:
e
Enter 1 if you're a teaching staff and 2 if you're a non teaching staff:
2
Enter your name:
kushi
Enter your age:
30
Enter your ID:
bs34
Enter your salary:
40000
Enter the field you work in:
sports
Name:kushi
Age:30

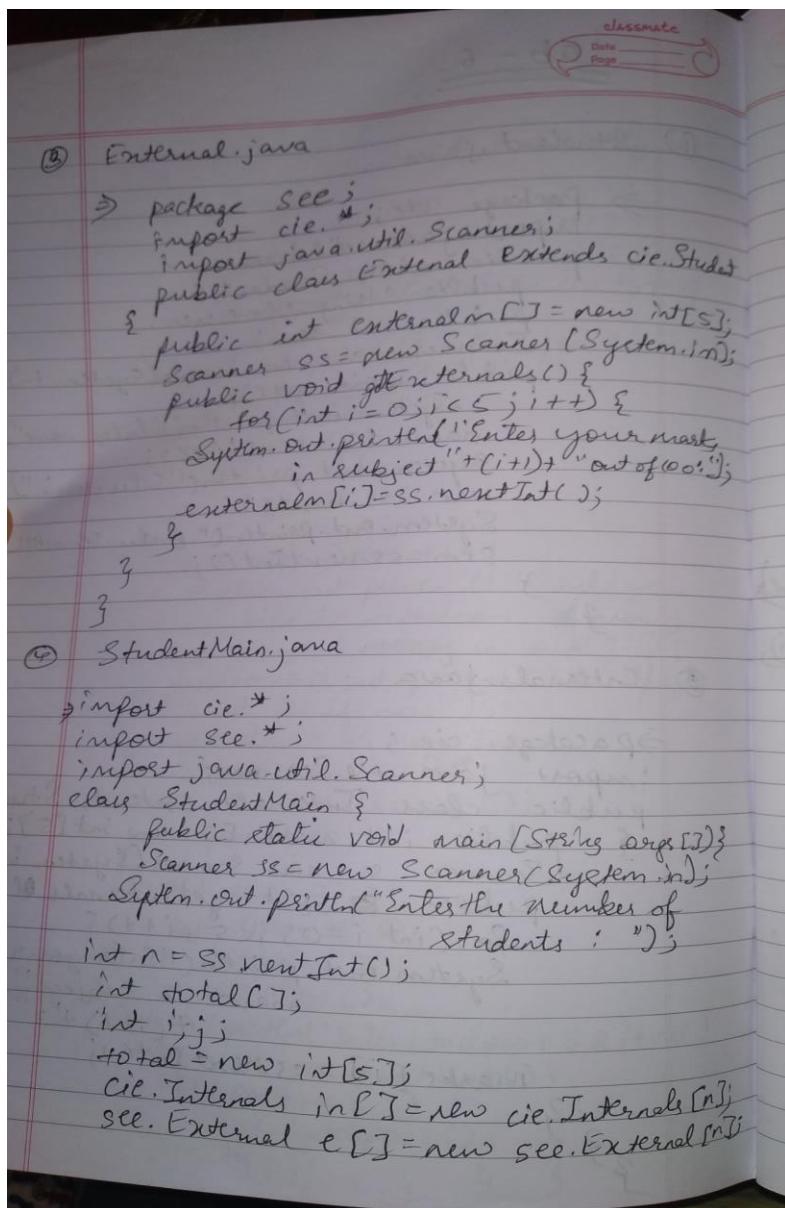
```

```
Enter e if you're an employee and s if you're a student:  
e  
Enter 1 if you're a teaching staff and 2 if you're a non teaching staff:  
2  
Enter your name:  
kushi  
Enter your age:  
38  
Enter your ID:  
bms34  
Enter your salary:  
40000  
Enter the field you work in:  
sports  
Name:kushi  
Age:38  
ID:bms34  
Salary:40000.0  
Field working in:sports  
C:\Program Files\Java\bin\basic>java Personmain  
Enter e if you're an employee and s if you're a student:  
s  
Enter 1 if you're an UG student and 2 if you're a PG student:  
1  
Enter your name:  
harsh  
Enter your age:  
20  
Enter your USN:  
1bm19cs059  
Enter your sem:  
3  
Enter your department:  
cse  
Name:harsh  
Age:20  
USN:1bm19cs059  
Semester:3  
Department:cse
```

```
cmd Command Prompt  
Enter your USN:  
1bm19cs059  
Enter your sem:  
3  
Enter your department:  
cse  
Name:harsh  
Age:20  
USN:1bm19cs059  
Semester:3  
Department:cse  
C:\Program Files\Java\bin\basic>java Personmain  
Enter e if you're an employee and s if you're a student:  
s  
Enter 1 if you're an UG student and 2 if you're a PG student:  
2  
Enter your name:  
yatharv  
Enter your age:  
26  
Enter your USN:  
1bm15cs058  
Enter your sem:  
2  
Enter your specialisation:  
computer science  
Name:yatharv  
Age:26  
USN:1bm15cs058  
Semester:2  
Specialization:computer science  
C:\Program Files\Java\bin\basic>
```

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.





This PC > OS (C:) > Program Files > Java > bin > basic > Student Pack

Name

- cie
- see
- External
- Internals
- Student
- StudentMain.class
- StudentMain

Command Prompt

```

C:\Program Files\Java\bin\basic\Student Pack>javac Student.java
C:\Program Files\Java\bin\basic\Student Pack>javac Internals.java
C:\Program Files\Java\bin\basic\Student Pack>javac External.java
C:\Program Files\Java\bin\basic\Student Pack>javac StudentMain.java
C:\Program Files\Java\bin\basic\Student Pack>java StudentMain
Enter the number of students:
2
Enter details of student 1:
Enter your name:
harshitha
Enter your usn:
1bm19cs059
Enter your semester:
3
Enter your internals marks:
Enter your marks in subject 1:
45
Enter your marks in subject 2:
47
Enter your marks in subject 3:
43
Enter your marks in subject 4:
39
Enter your marks in subject 5:
50
Enter your externals marks:

```

```
C:\ Command Prompt
C:\Program Files\Java\bin\basic\Student Pack>java StudentMain
Enter the number of students:
2
Enter details of student 1:
Enter your name:
harshitha
Enter your usn:
1bm19cs059
Enter your semester:
3
Enter your internals marks:
Enter your marks in subject 1:
49
Enter your marks in subject 2:
47
Enter your marks in subject 3:
43
Enter your marks in subject 4:
39
Enter your marks in subject 5:
50
Enter your externals marks:
Enter your marks in subject 1 out of 100:
90
Enter your marks in subject 2 out of 100:
98
Enter your marks in subject 3 out of 100:
89
Enter your marks in subject 4 out of 100:
99
Enter your marks in subject 5 out of 100:
87
Enter details of student 2:
Enter your name:
kushi
Enter your usn:
1bm19cs046
Enter your semester:
2
Enter your internals marks:
Enter your marks in subject 1:
```

```
23
Enter your marks in subject 2:
22
Enter your marks in subject 3:
36
Enter your marks in subject 4:
22
Enter your marks in subject 5:
34
Enter your externals marks:
Enter your marks in subject 1 out of 100:
87
Enter your marks in subject 2 out of 100:
67
Enter your marks in subject 3 out of 100:
65
Enter your marks in subject 4 out of 100:
56
Enter your marks in subject 5 out of 100:
88
Student 1
The total marks in subject 1:90
The total marks in subject 2:96
The total marks in subject 3:87
The total marks in subject 4:88
The total marks in subject 5:93
Student 2
The total marks in subject 1:66
The total marks in subject 2:55
The total marks in subject 3:68
The total marks in subject 4:50
The total marks in subject 5:78
C:\Program Files\Java\bin\basic\Student Pack>
```

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

Lab Program -7.

classmate
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Write a program to demonstrate
~~for~~ generics with multiple object
parameters.

```
import java.util.Scanner;
class Gener< A,B,C > {
    A ob1;
    B ob2;
    C ob3;
    Gener( A o1, B o2, C o3 ) {
        ob1=o1;
        ob2=o2;
        ob3=o3;
    }
    void print() {
        System.out.println("The type of
            A is :" + ob1.getClass().getName());
        System.out.println("The type of B is :"
            + ob2.getClass().getName());
        System.out.println("The type of C is :"
            + ob3.getClass().getName());
    }
    A get1() {
        return ob1;
    }
    B get2() {
        return ob2;
    }
    C get3() {
        return ob3;
    }
}
class GenerMain {
```

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Page _____

```

public static void main(String args[])
{
    Scanner ss = new Scanner (System.in);
    System.out.println("Enter a character:");
    char c = ss.next().charAt(0);
    Gener<Character, Boolean, String>
        ob = new Gener<Character, Boolean,
            String>(c, true, "yes");
    ob.print();
    char x = get1();
    System.out.println("Value: " + x);
    Boolean y = ob.get2();
    System.out.println("Value: " + y);
    String s = ob.get3();
    System.out.println("Value: " + s);
}

```

3

Q1. Command Prompt

```

C:\Program Files\Java\bin\basic>javac MPgenerics.java

C:\Program Files\Java\bin\basic>java GenerMain
Enter a character:
e
The type of A is:java.lang.Character
The type of B is:java.lang.Boolean
The type of C is:java.lang.String
value: e
value: true
value: yes

C:\Program Files\Java\bin\basic>

```

- 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 WrongAge() 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.

Lab Program -8.

```
import java.util.Scanner;
class WrongAge extends Exception{
    private int a;
    WrongAge(int a){
        a=a;
    }
    public String toString(){
        return "Input Age "+a+" is wrong";
    }
}
class Father {
    int fa;
    Father(int a) throws WrongAge{
        fa=a;
        if(fa<=0)
```

CLASSMATE
Date _____
Page _____

```

throw new WrongAge (fa); }

3 class Son extends Father {
    int Sa;
    Son (int a, int b) throws WrongAge {
        Super (b);
        Sa = a;
        if ((Sa >= fa) || (Sa <= 0)) {
            throw new WrongAge (Sa);
        }
        System.out.println ("Correct age");
    }
}

3 class ExceptionDemo {
    public static void main (String args[]) {
        try {
            Scanner ss = new Scanner (System.in);
            int fage, sage;
            System.out.println ("Enter father's age");
            fage = ss.nextInt ();
            System.out.println ("Enter son's age");
            sage = ss.nextInt ();
            Son s = new Son (sage, fage);
        } catch (WrongAge e) {
            System.out.println ("Caught Exception!");
            + e);
        }
    }
}

```

```

C:\ Command Prompt
C:\Program Files\Java\bin\basic>javac ehandling.java
C:\Program Files\Java\bin\basic>java ExceptionDemo
Enter father's age:
30
Enter son's age:
21
Correct age

C:\Program Files\Java\bin\basic>java ExceptionDemo
Enter father's age:
21
Enter son's age:
30
Caught Exception: Input age 30 is wrong

C:\Program Files\Java\bin\basic>java ExceptionDemo
Enter father's age:
0
Enter son's age:
45
Caught Exception: Input age 0 is wrong

C:\Program Files\Java\bin\basic>java ExceptionDemo
Enter father's age:
34
Enter son's age:
0
Caught Exception: Input age 0 is wrong

C:\Program Files\Java\bin\basic>

```

- 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.

Lab Program 9

Write a program to create two threads, one thread displaying BMS College of Engineering once every ten seconds and other displaying CSE once every two seconds.

```

→ class Thread1 implements Runnable {
    String name;
    Thread t;
    int sec;
    Thread1( String threadname, int seconds) {
        name = threadname;
        sec = seconds;
        t = new Thread( this, name );
        t.start();
    }
    public void run() {
        try {
            for (int i = 5; i > 0; i--) {
                System.out.println( " " + i + " " + name );
                Thread.sleep(sec);
            }
        } catch ( InterruptedException e ) {
            System.out.println( " " + name + " Interrupted " );
        }
    }
}
class MultiThreadDemo {
    public static void main( String args[] ) {
        Thread1 n1 = new Thread1( "BMS College of Engg",
                                10000 );
        Thread1 n2 = new Thread1( "CSE", 2000 );
    }
}

```

```
C:\ Command Prompt - java MultiThreadDemo
```

```
C:\Program Files\Java\bin\basic>javac thread1.java
C:\Program Files\Java\bin\basic>java MultiThreadDemo
CT:Thread[main,5,main]
5 BMS College of Engineering
CT:Thread[main,5,main]
5 CSE
4 CSE
3 CSE
```

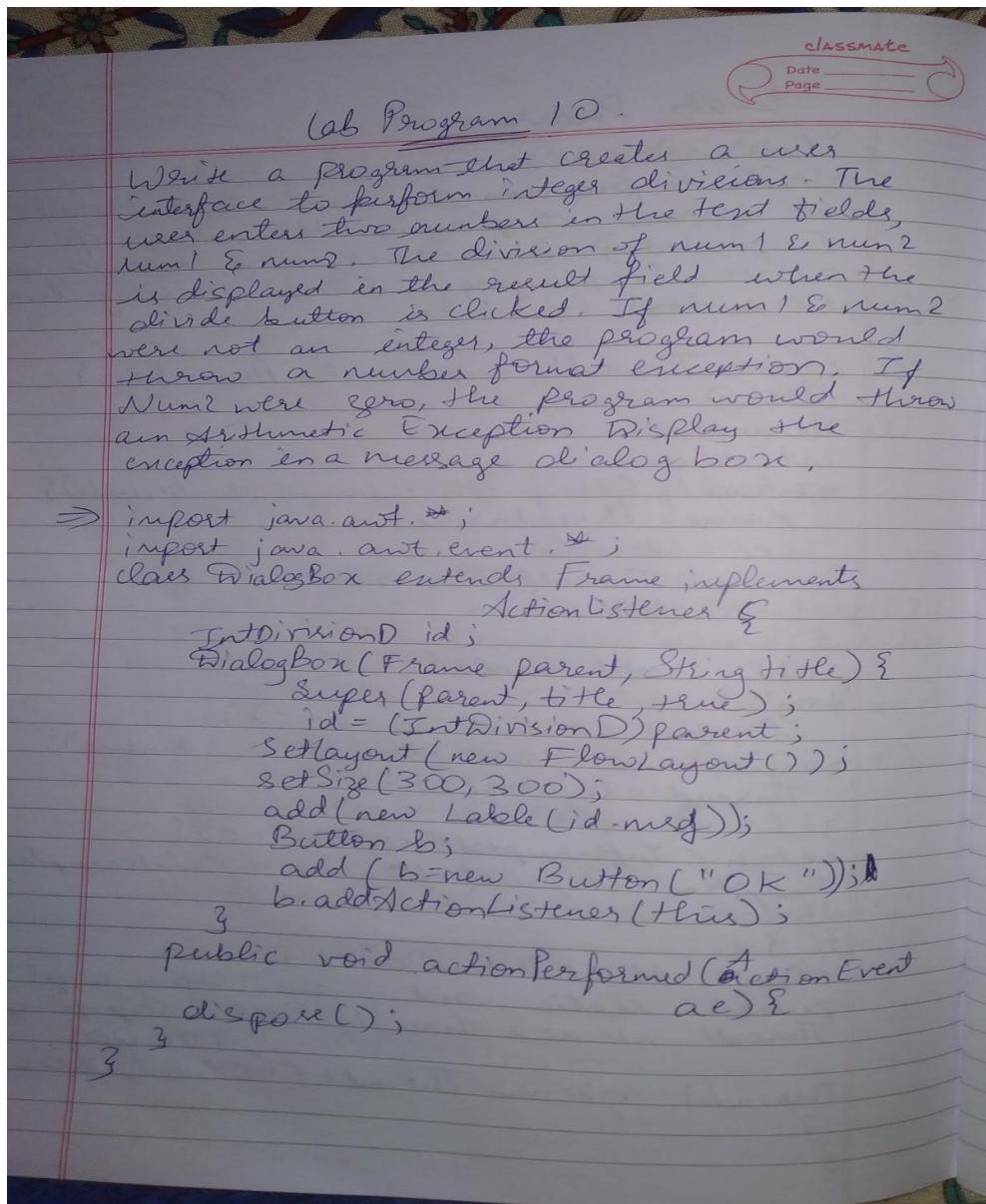
```
C:\ Command Prompt - java MultiThreadDemo
```

```
C:\Program Files\Java\bin\basic>javac thread1.java
C:\Program Files\Java\bin\basic>java MultiThreadDemo
CT:Thread[main,5,main]
5 BMS College of Engineering
CT:Thread[main,5,main]
5 CSE
4 CSE
3 CSE
2 CSE
1 CSE
4 BMS College of Engineering
```

```
C:\ Command Prompt
```

```
C:\Program Files\Java\bin\basic>javac thread1.java
C:\Program Files\Java\bin\basic>java MultiThreadDemo
CT:Thread[main,5,main]
5 BMS College of Engineering
CT:Thread[main,5,main]
5 CSE
4 CSE
3 CSE
2 CSE
1 CSE
4 BMS College of Engineering
3 BMS College of Engineering
2 BMS College of Engineering
1 BMS College of Engineering
C:\Program Files\Java\bin\basic>
```

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.



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```

public class IntDivisionD extends Frame
    implements ActionListener
{
    JTextField num1, num2, result;
    String res, msg;
    JButton div;
    public IntDivision()
    {
        setLayout(new FlowLayout());
        div = new JButton("Divide");
        Label numA = new Label("Number 1",
            Label.RIGHT);
        Label numB = new Label("Number 2:",
            Label.RIGHT);
        Label res1 = new Label("Result");
        num1 = new JTextField(5);
        num2 = new JTextField(5);
        result = new JTextField(10);
        add(numA);
        add(num1);
        add(div);
        add(numB);
        add(num2);
        add(res1);
        add(result);
        num1.addActionListener(this);
        num2.addActionListener(this);
        div.addActionListener(this);
        result.addActionListener(this);
        addWindowListener(new WindowAdapter()
        {
            public void windowClosing(
                WindowEvent we)
            {
                System.exit(0);
            }
        });
    }
}

```

classmate
Date _____
Page _____

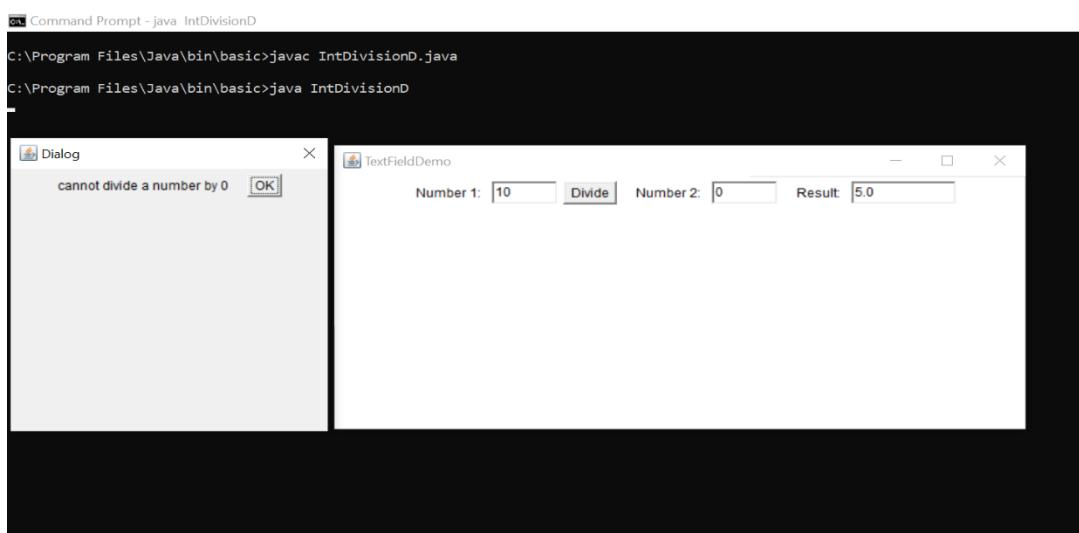
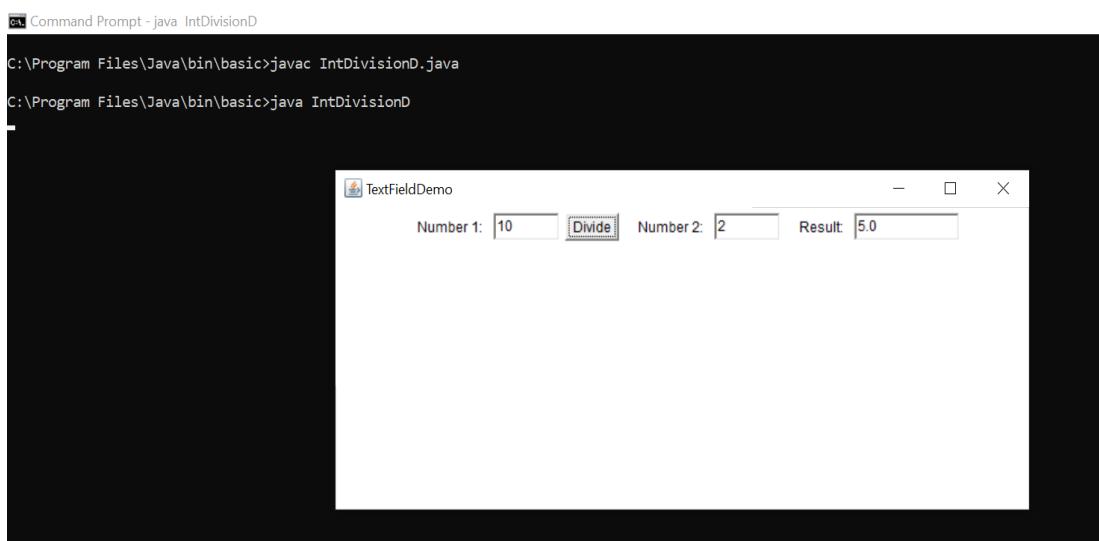
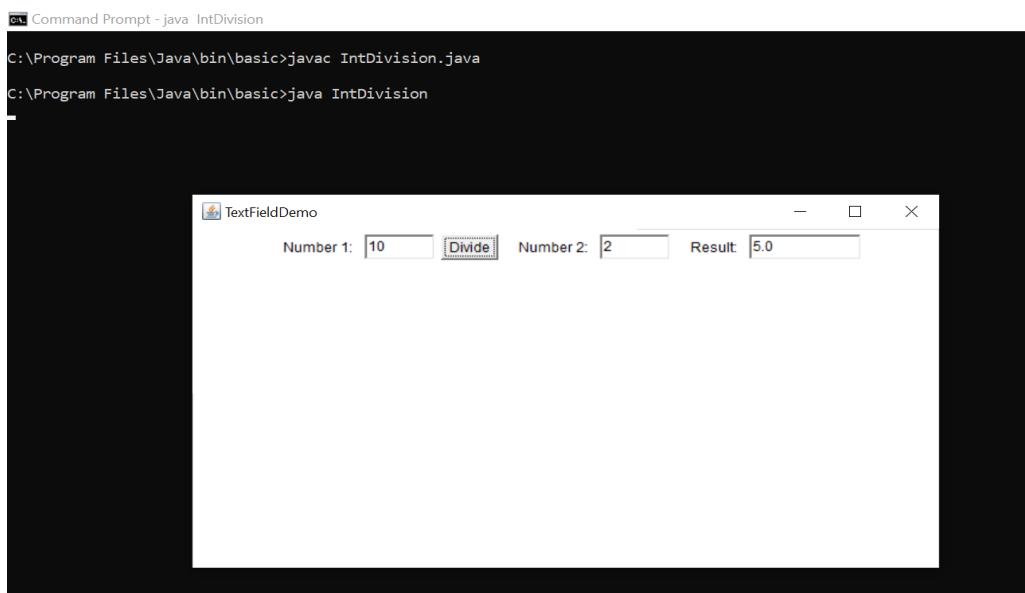
```

public void actionPerformed(ActionEvent ae) {
    String s = ae.getActionCommand();
    if (s.equals("Divide")) {
        result.setText(divide());
    }
}

String divide() {
    int n1, n2, n = 0;
    try {
        n1 = Integer.parseInt(num1.getText());
        n2 = Integer.parseInt(num2.getText());
    } catch (NumberFormatException nfe) {
        msg = "entered numbers must be integers";
        DialogBox d = new DialogBox(this, "Dialog");
        d.setVisible(true);
    }
    if (n2 == 0) {
        msg = "cannot divide a number by 0";
        DialogBox d = new DialogBox(this, "Dialog");
        d.setVisible(true);
        return "";
    }
    else {
        n = n1 / n2;
        res = Double.toString(n);
        return res;
    }
}

public static void main(String args[]) {
    IntDivisionD intdiv = new IntDivisionD();
    intdiv.setSize(new Dimension(380, 180));
    intdiv.setTitle("TextFieldDemo");
    intdiv.setVisible(true);
}

```



Command Prompt - java IntDivisionD

```
C:\Program Files\Java\bin\basic>javac IntDivisionD.java
C:\Program Files\Java\bin\basic>java IntDivisionD
```

