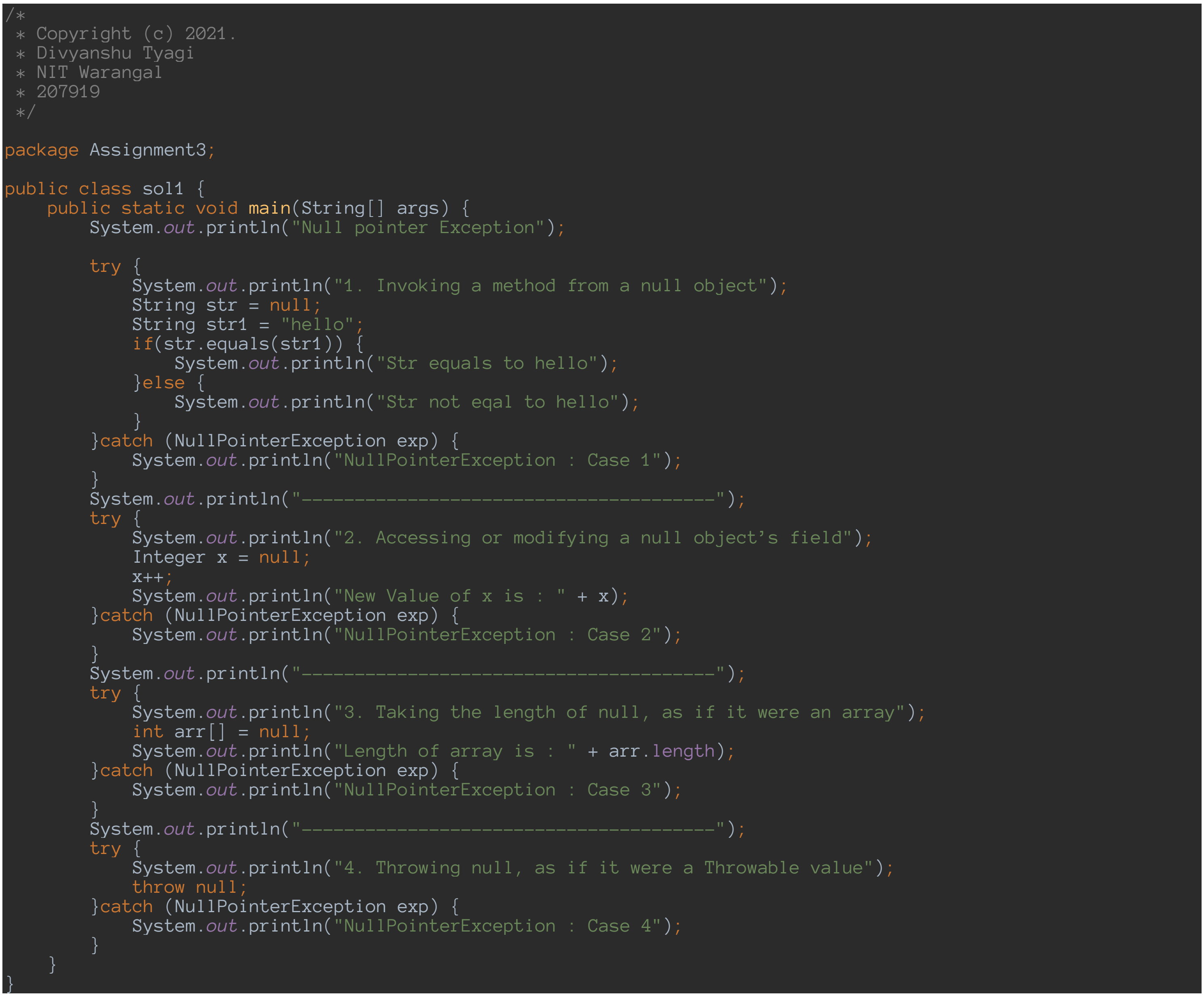
Divyanshu Tyagi
207919
MC20110

OOP LAB

Assignment – 03

Q1. Write a java program to illustrate 4 different possible NullPointerExeptions cases possible.
Solu.



```
/*
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 * NIT Warangal
 * 207919
 */

package Assignment3;

public class sol1 {
    public static void main(String[] args) {
        System.out.println("Null pointer Exception");

        try {
            System.out.println("1. Invoking a method from a null object");
            String str = null;
            String str1 = "hello";
            if(str.equals(str1)) {
                System.out.println("Str equals to hello");
            }else {
                System.out.println("Str not eqal to hello");
            }
        }catch (NullPointerException exp) {
            System.out.println("NullPointerException : Case 1");
        }
        System.out.println("---------------------------------------");
        try {
            System.out.println("2. Accessing or modifying a null object’s field");
            Integer x = null;
            x++;
            System.out.println("New Value of x is : " + x);
        }catch (NullPointerException exp) {
            System.out.println("NullPointerException : Case 2");
        }
        System.out.println("---------------------------------------");
        try {
            System.out.println("3. Taking the length of null, as if it were an array");
            int arr[] = null;
            System.out.println("Length of array is : " + arr.length);
        }catch (NullPointerException exp) {
            System.out.println("NullPointerException : Case 3");
        }
        System.out.println("---------------------------------------");
        try {
            System.out.println("4. Throwing null, as if it were a Throwable value");
            throw null;
        }catch (NullPointerException exp) {
            System.out.println("NullPointerException : Case 4");
        }
    }
}
```
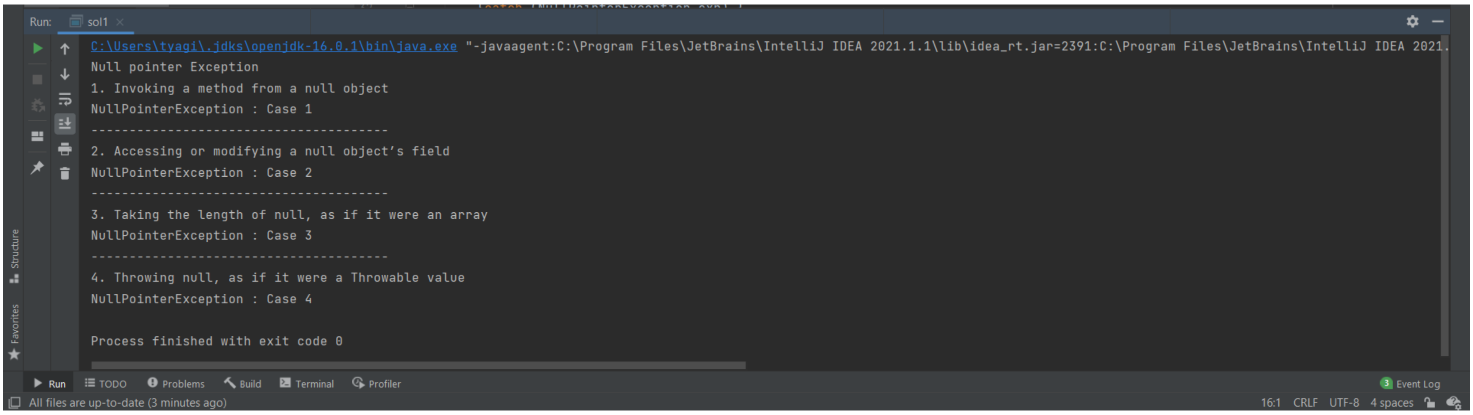

OUTPUT:



```
C:\Users\tyagi\.jdks\openjdk-16.0.1\bin\java.exe "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA 2021.1.1\lib\idea_rt.jar=2391:C:\Program Files\JetBrains\IntelliJ IDEA 2021.
Null pointer Exception
1. Invoking a method from a null object
NullPointerException : Case 1
---------------------------------------
2. Accessing or modifying a null object’s field
NullPointerException : Case 2
---------------------------------------
3. Taking the length of null, as if it were an array
NullPointerException : Case 3
---------------------------------------
4. Throwing null, as if it were a Throwable value
NullPointerException : Case 4

Process finished with exit code 0
```

Q2. You have been assigned to create a student database (Just information) of our institute. For a class named StudentInfo, create several objects for this class, each object representing one student (means array of objects). StudentInfo class is different and main class is different.The number of students should be taken from the user console. Student details should be like id, name, department name, college name. College name should be common to all of them (means this should be class variable). Now student id of each student should be unique, if any of the student id is repeating then handle with an user-defined exception. Name and dept name should not be empty, if they are empty then handle with user-defined exception. After all store the student’s data inside a file using stream classes not by using file classes. And number of students should be minimum of 10.

Solu.

```java
/*
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 * NIT Warangal
 * 207919
 */

package Assignment3;

import java.io.*;
import java.nio.charset.StandardCharsets;
import java.util.HashSet;
import java.util.Scanner;

class DuplicateIdException extends  Exception{
    DuplicateIdException(String prompt) {
        super(prompt);
    }
}

class EmptyStringException extends Exception {
    EmptyStringException(String prompt) {
        super(prompt);
    }
}

class StudentInfo {

    private String name, depart_name;
    private Integer id;
    static private String college_name;
    public StudentInfo(Integer id,String name, String depart_name) {
        this.id = id;
        this.name = name;
        this.depart_name = depart_name;
```
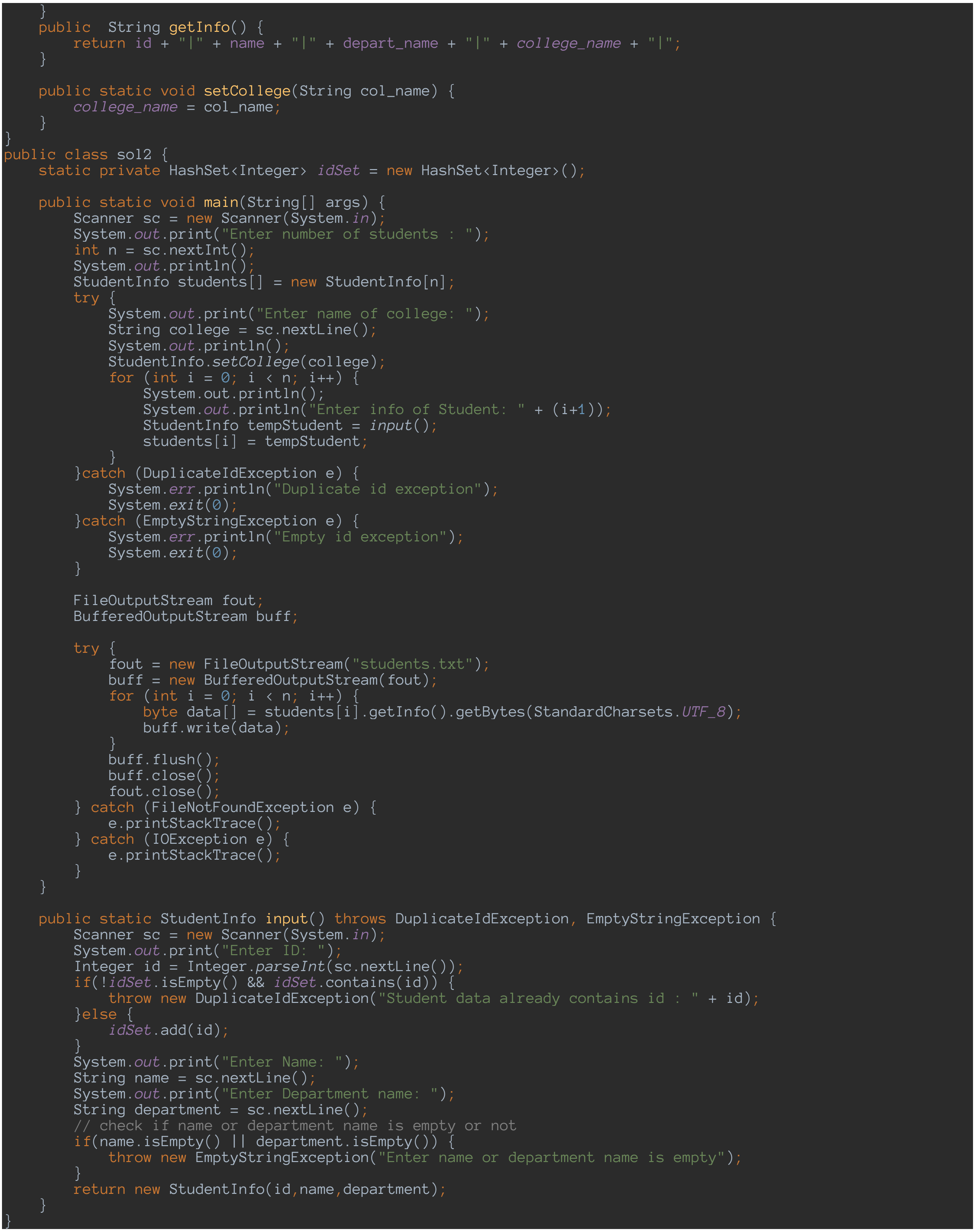
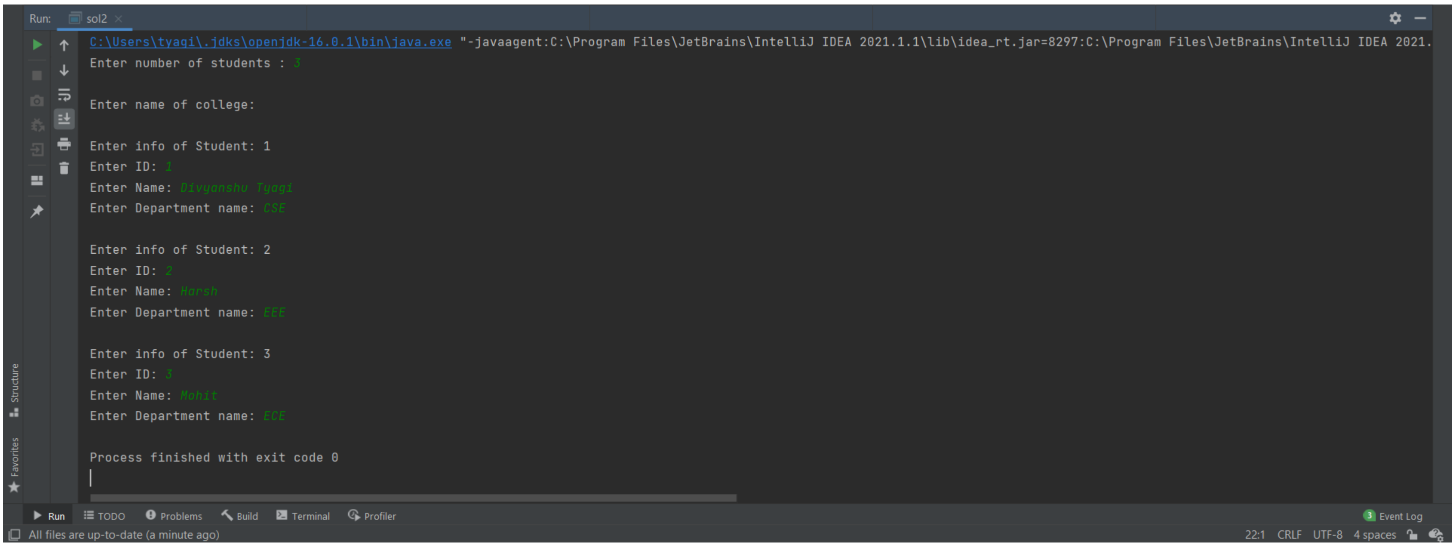
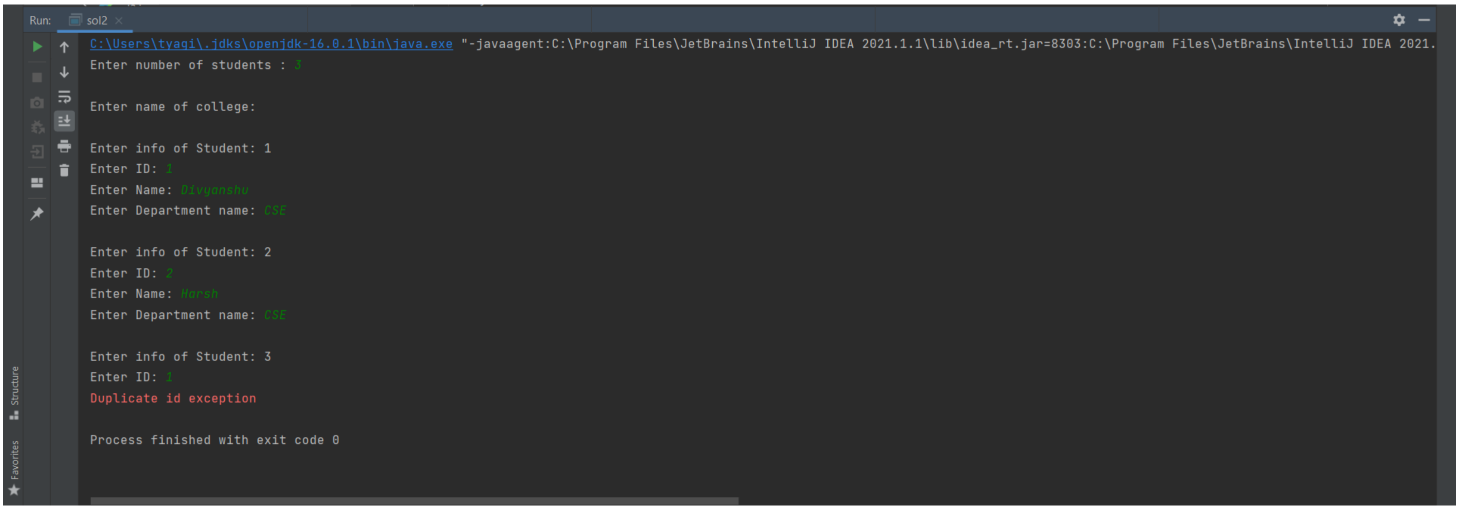



```
    }
    public  String getInfo() {
        return id + "|" + name + "|" + depart_name + "|" + college_name + "|";
    }

    public static void setCollege(String col_name) {
        college_name = col_name;
    }
}
public class sol2 {
    static private HashSet<Integer> idSet = new HashSet<Integer>();

    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter number of students : ");
        int n = sc.nextInt();
        System.out.println();
        StudentInfo students[] = new StudentInfo[n];
        try {
            System.out.print("Enter name of college: ");
            String college = sc.nextLine();
            System.out.println();
            StudentInfo.setCollege(college);
            for (int i = 0; i < n; i++) {
                System.out.println();
                System.out.println("Enter info of Student: " + (i+1));
                StudentInfo tempStudent = input();
                students[i] = tempStudent;
            }
        }catch (DuplicateIdException e) {
            System.err.println("Duplicate id exception");
            System.exit(0);
        }catch (EmptyStringException e) {
            System.err.println("Empty id exception");
            System.exit(0);
        }

        FileOutputStream fout;
        BufferedOutputStream buff;

        try {
            fout = new FileOutputStream("students.txt");
            buff = new BufferedOutputStream(fout);
            for (int i = 0; i < n; i++) {
                byte data[] = students[i].getInfo().getBytes(StandardCharsets.UTF_8);
                buff.write(data);
            }
            buff.flush();
            buff.close();
            fout.close();
        } catch (FileNotFoundException e) {
            e.printStackTrace();
        } catch (IOException e) {
            e.printStackTrace();
        }
    }

    public static StudentInfo input() throws DuplicateIdException, EmptyStringException {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter ID: ");
        Integer id = Integer.parseInt(sc.nextLine());
        if(!idSet.isEmpty() && idSet.contains(id)) {
            throw new DuplicateIdException("Student data already contains id : " + id);
        }else {
            idSet.add(id);
        }
        System.out.print("Enter Name: ");
        String name = sc.nextLine();
        System.out.print("Enter Department name: ");
        String department = sc.nextLine();
        // check if name or department name is empty or not
        if(name.isEmpty() || department.isEmpty()) {
            throw new EmptyStringException("Enter name or department name is empty");
        }
        return new StudentInfo(id,name,department);
    }
}
```

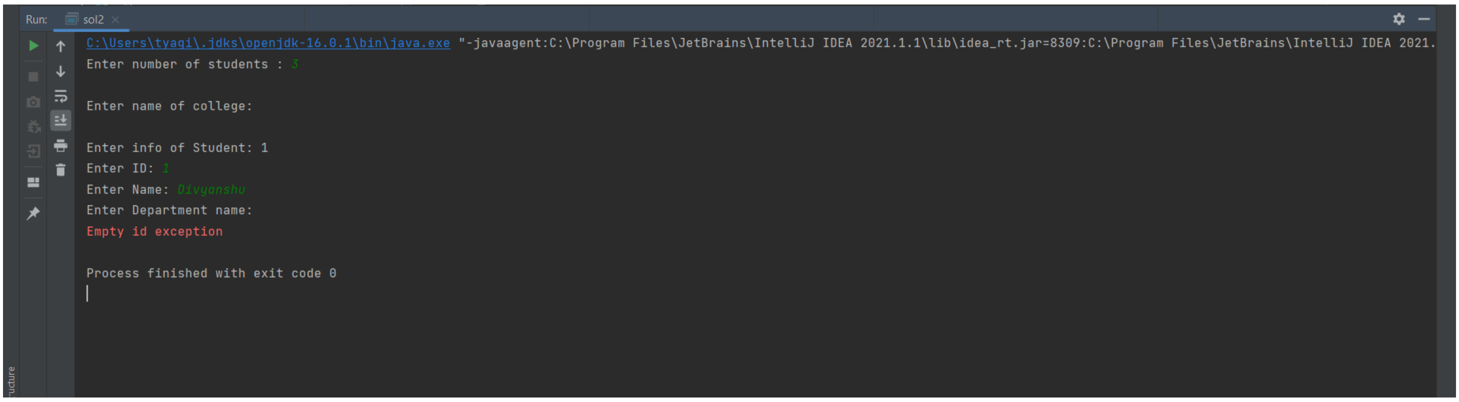
OUTPUT:



```
C:\Users\tyagi\.jdks\openjdk-16.0.1\bin\java.exe "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA 2021.1.1\lib\idea_rt.jar=8297:C:\Program Files\JetBrains\IntelliJ IDEA 2021.
Enter number of students : 3

Enter name of college:

Enter info of Student: 1
Enter ID: 1
Enter Name: Divyanshu Tyagi
Enter Department name: CSE

Enter info of Student: 2
Enter ID: 2
Enter Name: Harsh
Enter Department name: EEE

Enter info of Student: 3
Enter ID: 3
Enter Name: Mohit
Enter Department name: ECE

Process finished with exit code 0
```



```
C:\Users\tyagi\.jdks\openjdk-16.0.1\bin\java.exe "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA 2021.1.1\lib\idea_rt.jar=8303:C:\Program Files\JetBrains\IntelliJ IDEA 2021.
Enter number of students : 3

Enter name of college:

Enter info of Student: 1
Enter ID: 1
Enter Name: Divyanshu
Enter Department name: CSE

Enter info of Student: 2
Enter ID: 2
Enter Name: Harsh
Enter Department name: CSE

Enter info of Student: 3
Enter ID: 1
Duplicate id exception

Process finished with exit code 0
```



```
C:\Users\tyagi\.jdks\openjdk-16.0.1\bin\java.exe "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA 2021.1.1\lib\idea_rt.jar=8309:C:\Program Files\JetBrains\IntelliJ IDEA 2021.
Enter number of students : 3

Enter name of college:

Enter info of Student: 1
Enter ID: 1
Enter Name: Divyanshu
Enter Department name:
Empty id exception

Process finished with exit code 0
```

Q3. Write a java program to throw a custom exception when you are trying to read characters from a file, if number of characters in the file are more than specified number (K), Note K should be >=100.

Solu.

```java
/*
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 * NIT Warangal
 * 207919
 */

package Assignment3;

import java.io.BufferedInputStream;
import java.io.FileInputStream;
import java.io.IOException;
import java.util.Scanner;

class MoreThanKException extends Exception {
    MoreThanKException(String str) {
        super(str);
    }
}
public class sol3 {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter Value of K: ");
        int k = sc.nextInt();
        try {
            FileInputStream fin = new FileInputStream("readFile.txt");
            BufferedInputStream bin = new BufferedInputStream(fin);
            if(bin.available() > 0) {
                byte[] bts = bin.readAllBytes();
                if(bts.length > k)
                    throw new MoreThanKException("Number of characters in file are <" + bts.length + "> i.e
more than K");

            }
        } catch (IOException e) {
            e.printStackTrace();
        } catch (MoreThanKException e) {
            e.printStackTrace();
            System.exit(0);
        }
    }
}
```
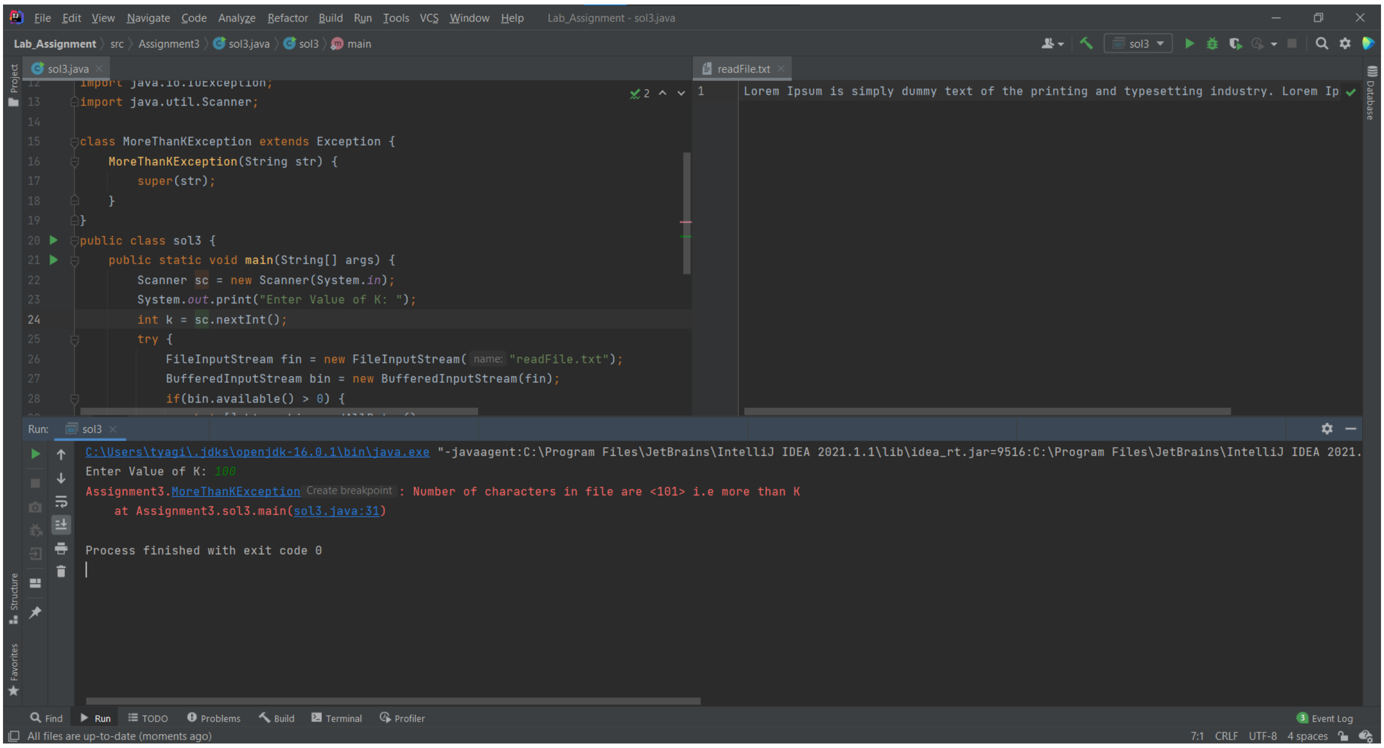

OUTPUT:


File Edit View Navigate Code Analyze Refactor Build Run Tools VCS Window Help
Lab_Assignment - sol3.java
Lab_Assignment 〉 src 〉 Assignment3 〉 sol3.java 〉 sol3 〉 main
sol3.java
readFile.txt
sol3
Run: sol3
Find
Run
TODO
Problems
Build
Terminal
Profiler
Event Log
All files are up-to-date (moments ago)
7:1 CRLF UTF-8 4 spaces

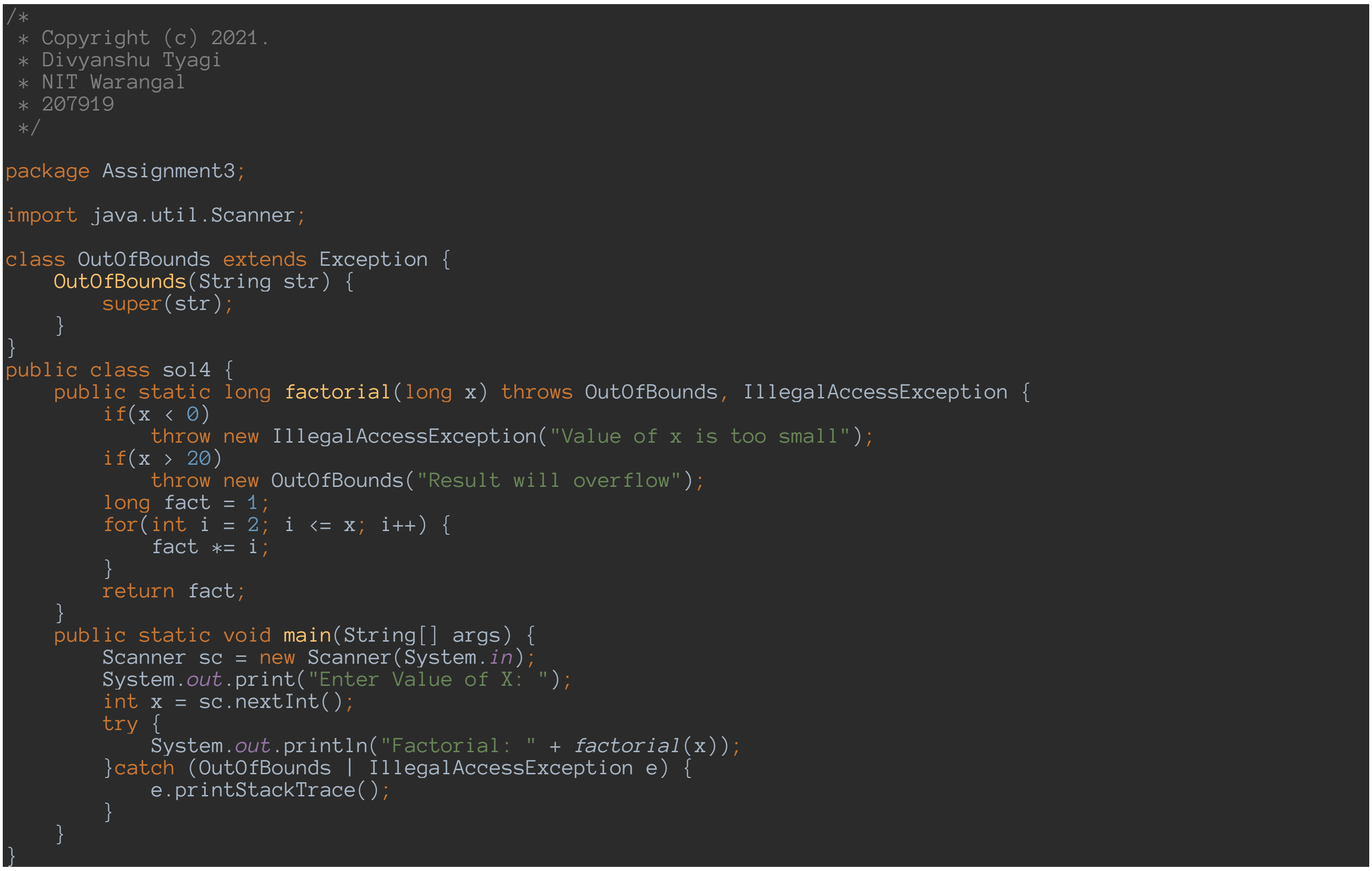
```java
import java.io.IOException;
import java.util.Scanner;

class MoreThanKException extends Exception {
    MoreThanKException(String str) {
        super(str);
    }
}
public class sol3 {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter Value of K: ");
        int k = sc.nextInt();
        try {
            FileInputStream fin = new FileInputStream( name: "readFile.txt");
            BufferedInputStream bin = new BufferedInputStream(fin);
            if(bin.available() > 0) {
```

```
1    Lorem Ipsum is simply dummy text of the printing and typesetting industry. Lorem Ip
```

```
C:\Users\tyagi\.jdks\openjdk-16.0.1\bin\java.exe "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA 2021.1.1\lib\idea_rt.jar=9516:C:\Program Files\JetBrains\IntelliJ IDEA 2021.
Enter Value of K: 100
Assignment3.MoreThanKException Create breakpoint : Number of characters in file are <101> i.e more than K
    at Assignment3.sol3.main(sol3.java:31)

Process finished with exit code 0
```

Q4. Write a java program called factorial.java that computes the factorials and catches the result in a long variable. The long type of variable has its own range. For example, 20! Is as high as the range of long type. So, check the argument passed and throw an exception, if it is too big or too small. If x is less than 0 throw an IllegalArgumentException with a message. If x is more than specific range then throw a custom exception saying “Result will overflow”. Here x is a value for which we want to find factorial (it should be user-defined).

Solu.



```java
/*
 * Copyright (c) 2021.
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 * NIT Warangal
 * 207919
 */

package Assignment3;

import java.util.Scanner;

class OutOfBounds extends Exception {
    OutOfBounds(String str) {
        super(str);
    }
}
public class sol4 {
    public static long factorial(long x) throws OutOfBounds, IllegalAccessException {
        if(x < 0)
            throw new IllegalAccessException("Value of x is too small");
        if(x > 20)
            throw new OutOfBounds("Result will overflow");
        long fact = 1;
        for(int i = 2; i <= x; i++) {
            fact *= i;
        }
        return fact;
    }
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter Value of X: ");
        int x = sc.nextInt();
        try {
            System.out.println("Factorial: " + factorial(x));
        }catch (OutOfBounds | IllegalAccessException e) {
            e.printStackTrace();
        }
    }
}
```
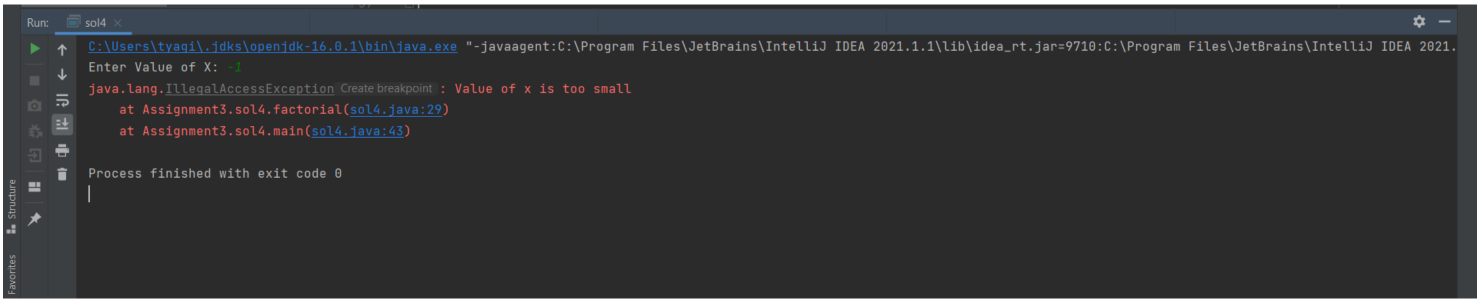
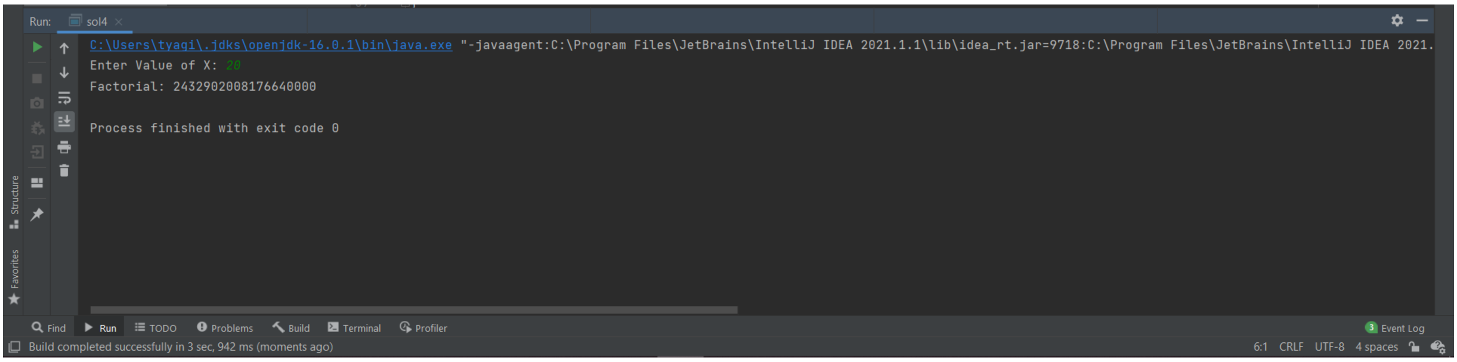

OUTPUT:

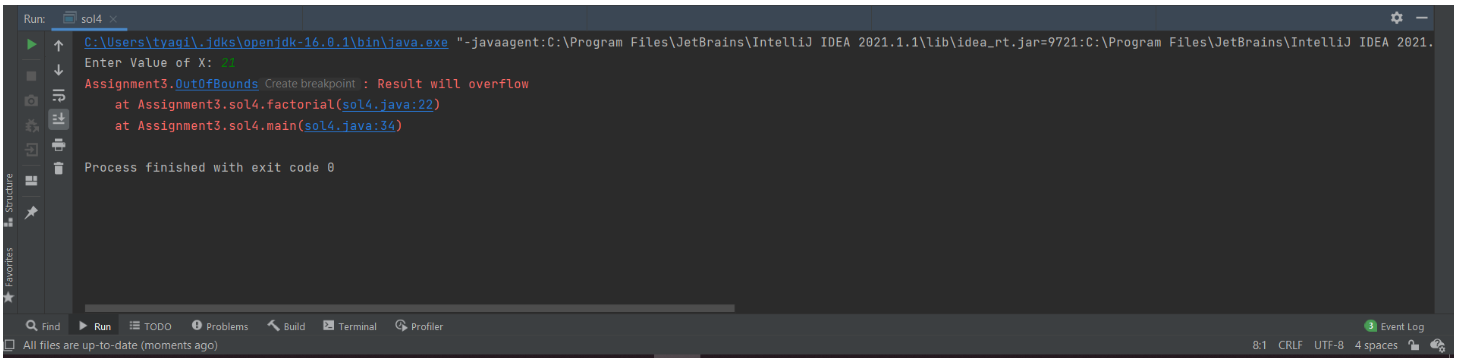


```
C:\Users\tyagi\.jdks\openjdk-16.0.1\bin\java.exe "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA 2021.1.1\lib\idea_rt.jar=9710:C:\Program Files\JetBrains\IntelliJ IDEA 2021.
Enter Value of X: -1
java.lang.IllegalAccessException Create breakpoint : Value of x is too small
    at Assignment3.sol4.factorial(sol4.java:29)
    at Assignment3.sol4.main(sol4.java:43)

Process finished with exit code 0
```



```
C:\Users\tyagi\.jdks\openjdk-16.0.1\bin\java.exe "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA 2021.1.1\lib\idea_rt.jar=9718:C:\Program Files\JetBrains\IntelliJ IDEA 2021.
Enter Value of X: 20
Factorial: 2432902008176640000

Process finished with exit code 0
```

```
Build completed successfully in 3 sec, 942 ms (moments ago)                6:1  CRLF  UTF-8  4 spaces
```



```
C:\Users\tyagi\.jdks\openjdk-16.0.1\bin\java.exe "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA 2021.1.1\lib\idea_rt.jar=9721:C:\Program Files\JetBrains\IntelliJ IDEA 2021.
Enter Value of X: 21
Assignment3.OutOfBounds : Result will overflow
	at Assignment3.sol4.factorial(sol4.java:22)
	at Assignment3.sol4.main(sol4.java:34)

Process finished with exit code 0
```

```
All files are up-to-date (moments ago)                8:1  CRLF  UTF-8  4 spaces
```

Q5. Write a java program to detect a loop in the linked list.

Solu.

```java
/*
 * Copyright (c) 2021.
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 * NIT Warangal
 * 207919
 */

package Assignment3;

import java.util.List;

class ListNode {
    int val;
    ListNode next;
    ListNode(int val) {this.val = val; this.next = null;}
    ListNode(int val, ListNode next) {this.val = val; this.next = next;}
}
public class sol5 {
    public static boolean hasCycle(ListNode head) {
        if(head==null) return false;
        ListNode slow = head;
        ListNode fast = head;
        while(fast.next!=null && fast.next.next!=null) {
            slow = slow.next;
            fast = fast.next.next;
            if(fast == slow) return true;
        }
        return false;
    }

    public static void main(String[] args) {
        ListNode n1 = new ListNode(1);
        ListNode head = n1;
        ListNode n2 = new ListNode(2);
        n1.next = n2;
        ListNode n3 = new ListNode(3);
        n2.next = n3;
        ListNode n4 = new ListNode(4);
        n3.next = n4;
        ListNode n5 = new ListNode(5,n1);
```
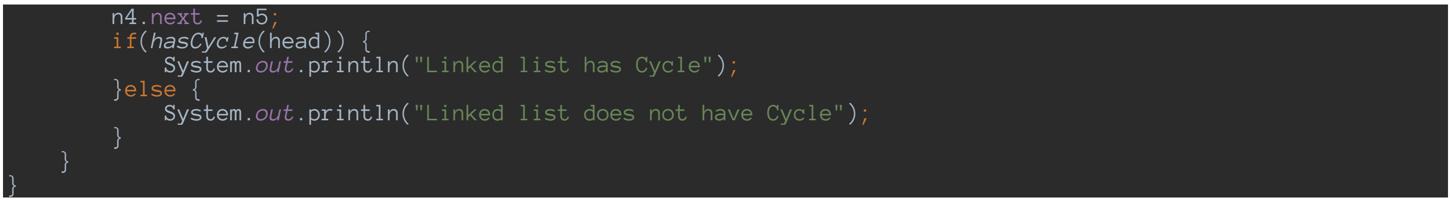
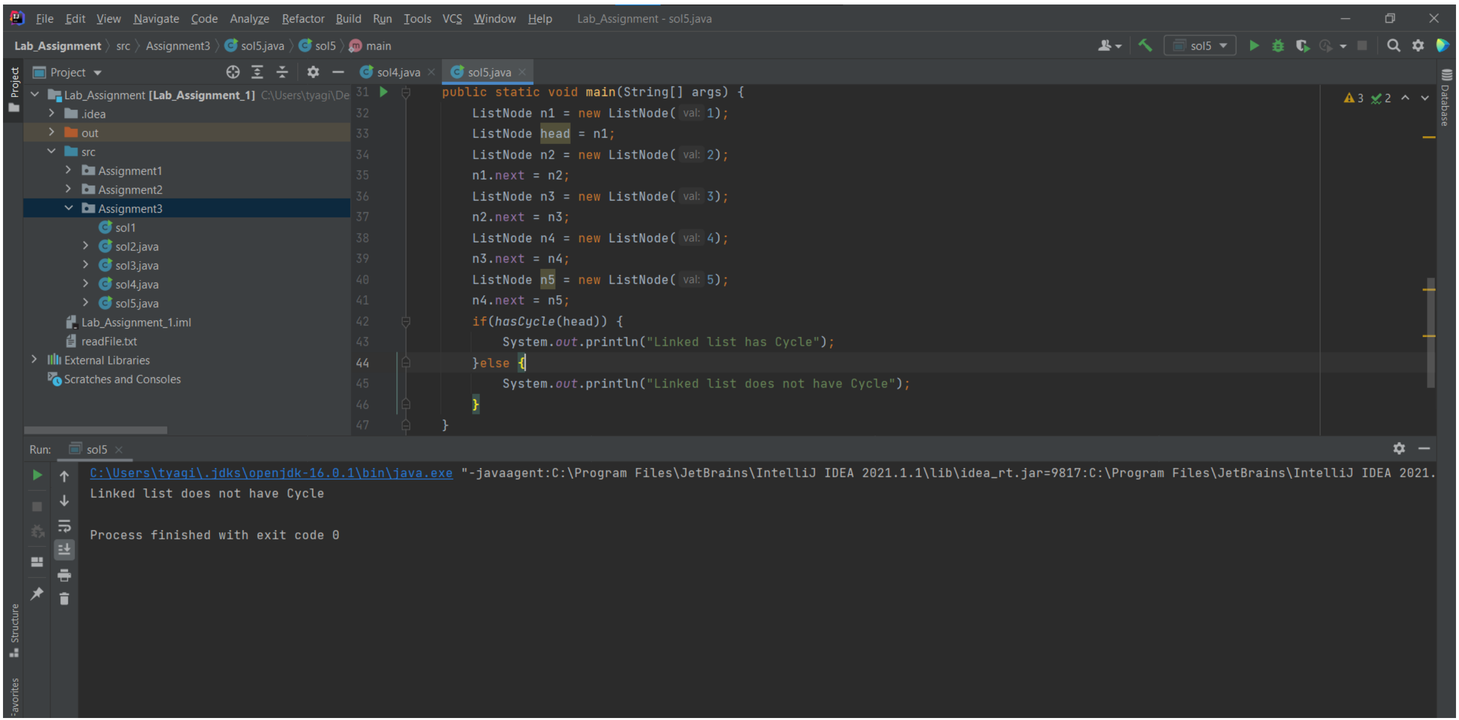



```
        n4.next = n5;
        if(hasCycle(head)) {
            System.out.println("Linked list has Cycle");
        }else {
            System.out.println("Linked list does not have Cycle");
        }
    }
}
```

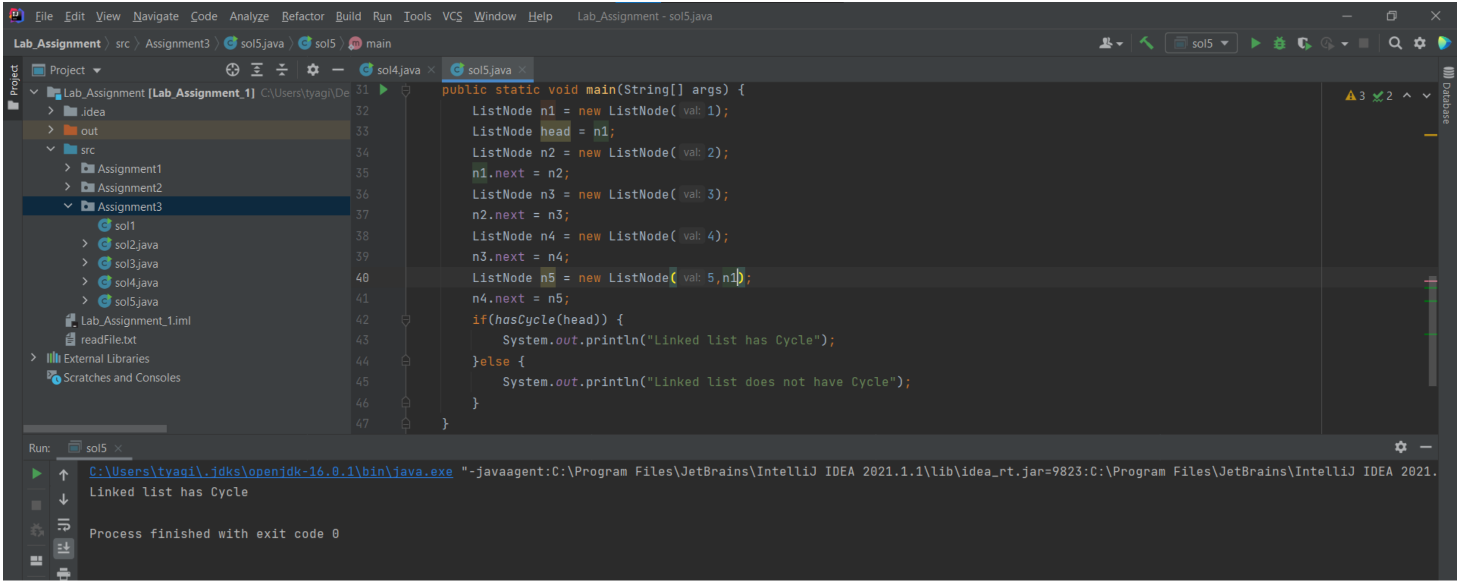
OUTPUT :



File Edit View Navigate Code Analyze Refactor Build Run Tools VCS Window Help
Lab_Assignment - sol5.java
Lab_Assignment 〉 src 〉 Assignment3 〉 sol5.java 〉 sol5 〉 main
Project
Lab_Assignment [Lab_Assignment_1] C:\Users\tyagi\De
.idea
out
src
Assignment1
Assignment2
Assignment3
sol1
sol2.java
sol3.java
sol4.java
sol5.java
Lab_Assignment_1.iml
readFile.txt
External Libraries
Scratches and Consoles
sol4.java
sol5.java
Run:
sol5

```
    public static void main(String[] args) {
        ListNode n1 = new ListNode( val: 1);
        ListNode head = n1;
        ListNode n2 = new ListNode( val: 2);
        n1.next = n2;
        ListNode n3 = new ListNode( val: 3);
        n2.next = n3;
        ListNode n4 = new ListNode( val: 4);
        n3.next = n4;
        ListNode n5 = new ListNode( val: 5);
        n4.next = n5;
        if(hasCycle(head)) {
            System.out.println("Linked list has Cycle");
        }else {
            System.out.println("Linked list does not have Cycle");
        }
    }
```

```
C:\Users\tyagi\.jdks\openjdk-16.0.1\bin\java.exe "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA 2021.1.1\lib\idea_rt.jar=9817:C:\Program Files\JetBrains\IntelliJ IDEA 2021.
Linked list does not have Cycle

Process finished with exit code 0
```



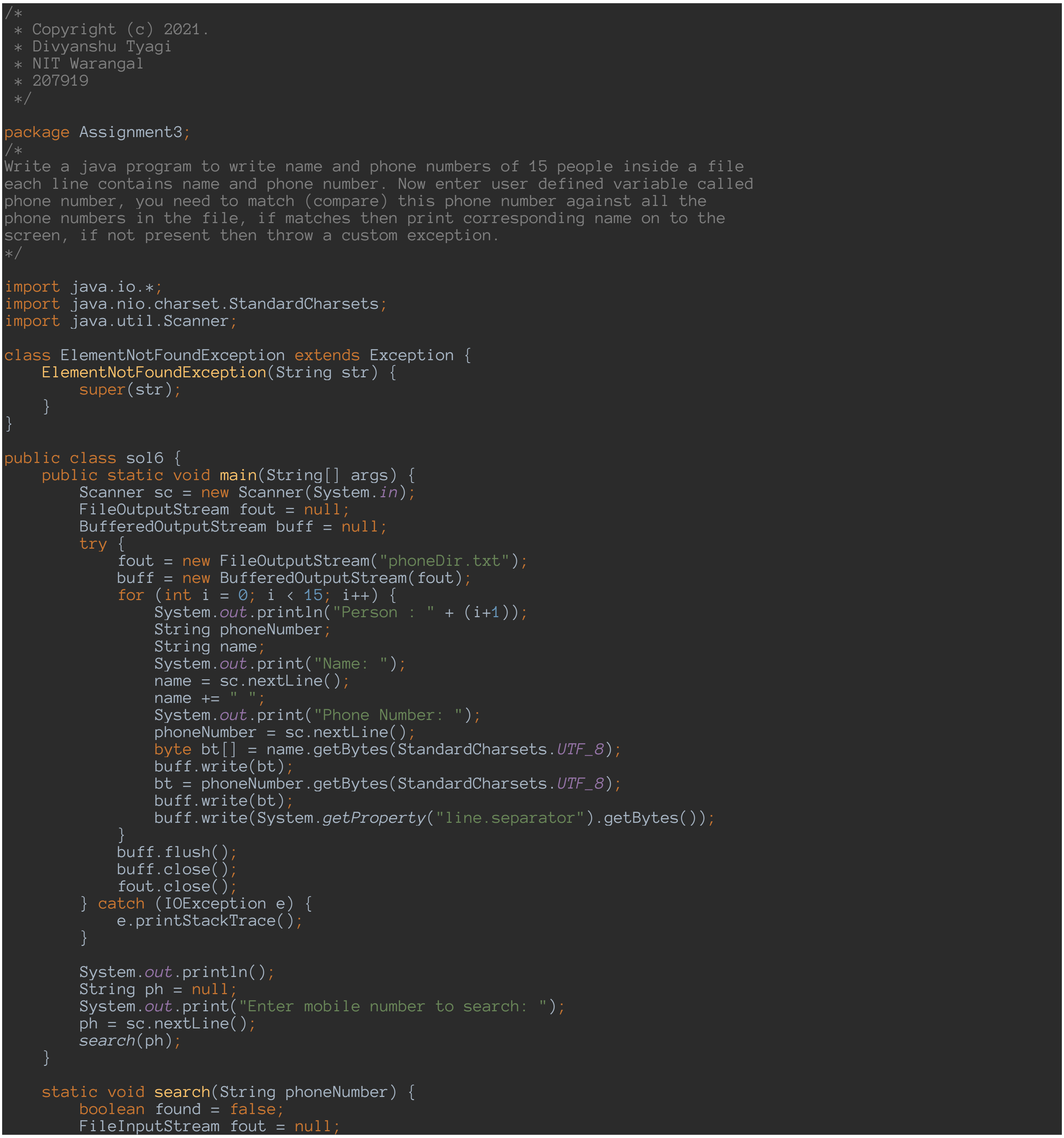
File Edit View Navigate Code Analyze Refactor Build Run Tools VCS Window Help
Lab_Assignment - sol5.java
Lab_Assignment 〉 src 〉 Assignment3 〉 sol5.java 〉 sol5 〉 main
Project
Lab_Assignment [Lab_Assignment_1] C:\Users\tyagi\De
.idea
out
src
Assignment1
Assignment2
Assignment3
sol1
sol2.java
sol3.java
sol4.java
sol5.java
Lab_Assignment_1.iml
readFile.txt
External Libraries
Scratches and Consoles
sol4.java
sol5.java
Run:
sol5

```
    public static void main(String[] args) {
        ListNode n1 = new ListNode( val: 1);
        ListNode head = n1;
        ListNode n2 = new ListNode( val: 2);
        n1.next = n2;
        ListNode n3 = new ListNode( val: 3);
        n2.next = n3;
        ListNode n4 = new ListNode( val: 4);
        n3.next = n4;
        ListNode n5 = new ListNode( val: 5,n1);
        n4.next = n5;
        if(hasCycle(head)) {
            System.out.println("Linked list has Cycle");
        }else {
            System.out.println("Linked list does not have Cycle");
        }
    }
```

```
C:\Users\tyagi\.jdks\openjdk-16.0.1\bin\java.exe "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA 2021.1.1\lib\idea_rt.jar=9823:C:\Program Files\JetBrains\IntelliJ IDEA 2021.
Linked list has Cycle

Process finished with exit code 0
```

Q6. Write a java program to write name and phone numbers of 15 people inside a file each line contains name and phone number. Now enter user defined variable called phone number, you need to match (compare) this phone number against all the phone numbers in the file, if matches then print corresponding name on to the screen, if not present then throw a custom exception.

Solu.



```java
/*
 * Copyright (c) 2021.
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 * NIT Warangal
 * 207919
 */

package Assignment3;
/*
Write a java program to write name and phone numbers of 15 people inside a file
each line contains name and phone number. Now enter user defined variable called
phone number, you need to match (compare) this phone number against all the
phone numbers in the file, if matches then print corresponding name on to the
screen, if not present then throw a custom exception.
*/

import java.io.*;
import java.nio.charset.StandardCharsets;
import java.util.Scanner;

class ElementNotFoundException extends Exception {
    ElementNotFoundException(String str) {
        super(str);
    }
}

public class sol6 {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        FileOutputStream fout = null;
        BufferedOutputStream buff = null;
        try {
            fout = new FileOutputStream("phoneDir.txt");
            buff = new BufferedOutputStream(fout);
            for (int i = 0; i < 15; i++) {
                System.out.println("Person : " + (i+1));
                String phoneNumber;
                String name;
                System.out.print("Name: ");
                name = sc.nextLine();
                name += " ";
                System.out.print("Phone Number: ");
                phoneNumber = sc.nextLine();
                byte bt[] = name.getBytes(StandardCharsets.UTF_8);
                buff.write(bt);
                bt = phoneNumber.getBytes(StandardCharsets.UTF_8);
                buff.write(bt);
                buff.write(System.getProperty("line.separator").getBytes());
            }
            buff.flush();
            buff.close();
            fout.close();
        } catch (IOException e) {
            e.printStackTrace();
        }

        System.out.println();
        String ph = null;
        System.out.print("Enter mobile number to search: ");
        ph = sc.nextLine();
        search(ph);
    }

    static void search(String phoneNumber) {
        boolean found = false;
        FileInputStream fout = null;
        DataInputStream in = null;
        BufferedReader br = null;
        try {
            fout = new FileInputStream("phoneDir.txt");
            in = new DataInputStream(fout);
            br = new BufferedReader(new InputStreamReader(in));
            String strLine;
            while ((strLine = br.readLine()) != null)   {
                String[] tokens = strLine.split(" ");
                String phNo = null;
                if(tokens.length == 2) {
                    phNo = tokens[1];
                    if(phoneNumber.equals(phNo)) {
                        System.out.println("Corresponding name for Phone No " + phoneNumber + " this is : " +
tokens[0]);
                        found = true;
                        break;
                    }
                }
                else if(tokens.length == 3) {
                    phNo = tokens[2];
                    if(phoneNumber.equals(phNo)) {
                        System.out.println("Corresponding name for Phone No " + phoneNumber + " this is : " +
tokens[0] + " " + tokens[1]);
                        found = true;
                        break;
                    }
                }
            }
            br.close();
            in.close();
            fout.close();
            if(!found) {
                throw new ElementNotFoundException("Phone Number <" + phoneNumber + "> not found in record");
            }
        }catch (IOException | ElementNotFoundException e) {
            e.printStackTrace();
        }
    }
}
```
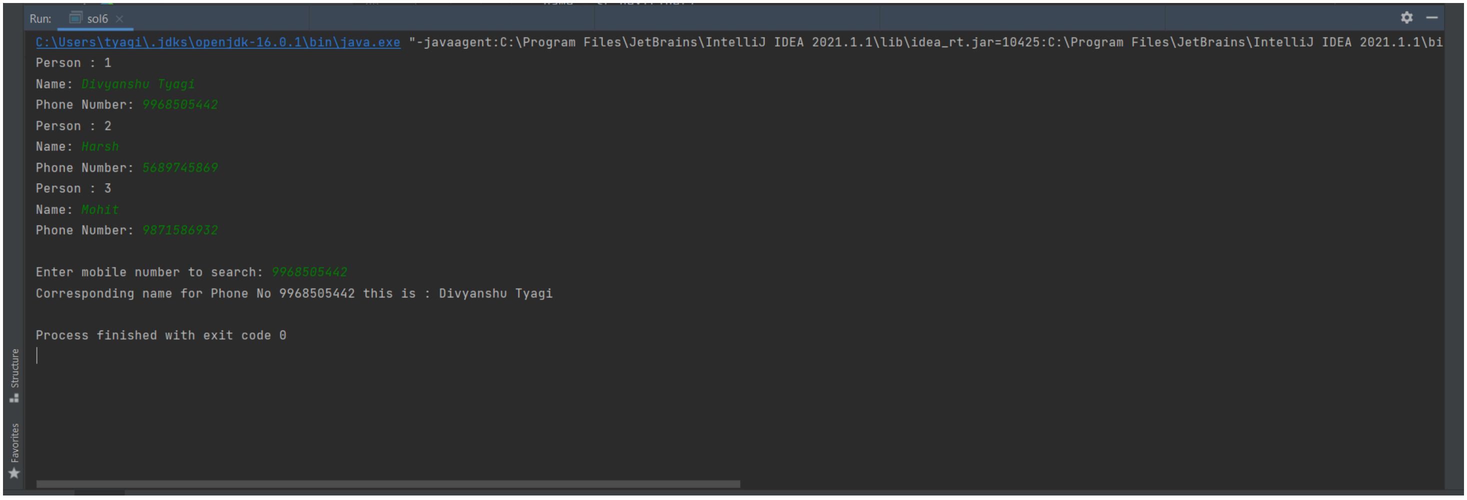
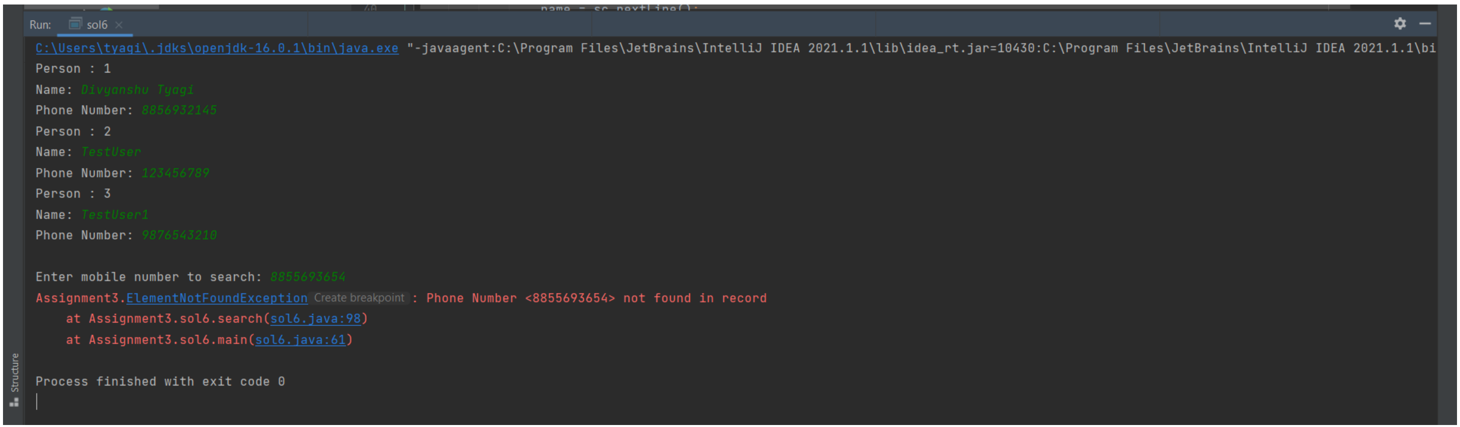

OUTPUT:

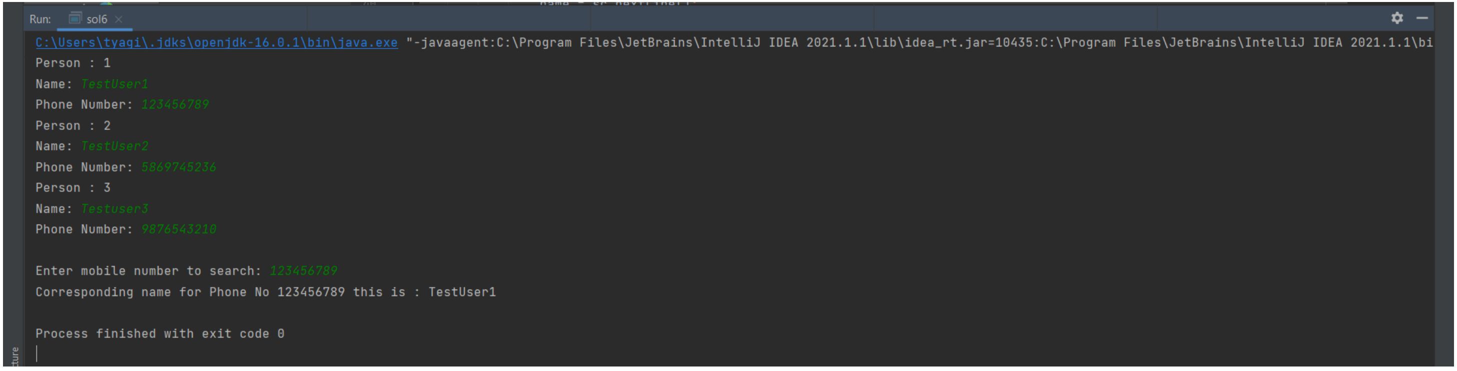
(For simplicity's sake searching within 3 records)



```
C:\Users\tyagi\.jdks\openjdk-16.0.1\bin\java.exe "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA 2021.1.1\lib\idea_rt.jar=10425:C:\Program Files\JetBrains\IntelliJ IDEA 2021.1.1\bi
Person : 1
Name: Divyanshu Tyagi
Phone Number: 9968505442
Person : 2
Name: Harsh
Phone Number: 5689745869
Person : 3
Name: Mohit
Phone Number: 9871586932

Enter mobile number to search: 9968505442
Corresponding name for Phone No 9968505442 this is : Divyanshu Tyagi

Process finished with exit code 0
```



```
C:\Users\tyagi\.jdks\openjdk-16.0.1\bin\java.exe "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA 2021.1.1\lib\idea_rt.jar=10430:C:\Program Files\JetBrains\IntelliJ IDEA 2021.1.1\bi
Person : 1
Name: Divyanshu Tyagi
Phone Number: 8856932145
Person : 2
Name: TestUser
Phone Number: 123456789
Person : 3
Name: TestUser1
Phone Number: 9876543210

Enter mobile number to search: 8855693654
Assignment3.ElementNotFoundException Create breakpoint : Phone Number <8855693654> not found in record
    at Assignment3.sol6.search(sol6.java:98)
    at Assignment3.sol6.main(sol6.java:61)

Process finished with exit code 0
```



```
C:\Users\tyagi\.jdks\openjdk-16.0.1\bin\java.exe "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA 2021.1.1\lib\idea_rt.jar=10435:C:\Program Files\JetBrains\IntelliJ IDEA 2021.1.1\bi
Person : 1
Name: TestUser1
Phone Number: 123456789
Person : 2
Name: TestUser2
Phone Number: 5869745236
Person : 3
Name: Testuser3
Phone Number: 9876543210

Enter mobile number to search: 123456789
Corresponding name for Phone No 123456789 this is : TestUser1

Process finished with exit code 0
```