Java practicals

FS19CO042

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FS19CO042 SECOND YEAR, FIRST SHIFT

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Practical no. 1

Aim:

Getting started with Java Application Development using IDE

1.1 Check whether latest version of java (at least JDK 1.8)is installed or no
and install it.

1.2 Download and install the IntelliJ IDEA Community Edition/ NetBeans ID
later version of IDE

1.3 Create a Java Project/ Application in the IDE

1.4 Create a Java class Person containing two variables name and yearOfB
types, take inputs from the command line argument, a method to display
person.

1.5 Save the project and run it.

1.6 Explore all the features (the menu and shortcuts) of the IDE. Learn abo

Tool used: Editor (Notepad/Intellij IDE), JDK and JRE

Theory:

Java

Java is a programming language created by James Gosling from Sun Microsystem
target of Java is to write a program once and then run this program on multiple op
publicly available version of Java (Java 1.0) was released in 1995. Sun Microsyste
Oracle Corporation in 2010. Oracle has now the steermanship for Java. In 2006 S
available under the GNU General Public License (GPL). Oracle continues this proj

Java virtual machine (JVM)

The Java virtual machine (JVM) is a software implementation of a computer that e
real machine.
The Java virtual machine is written specifically for a specific operating system, e.g

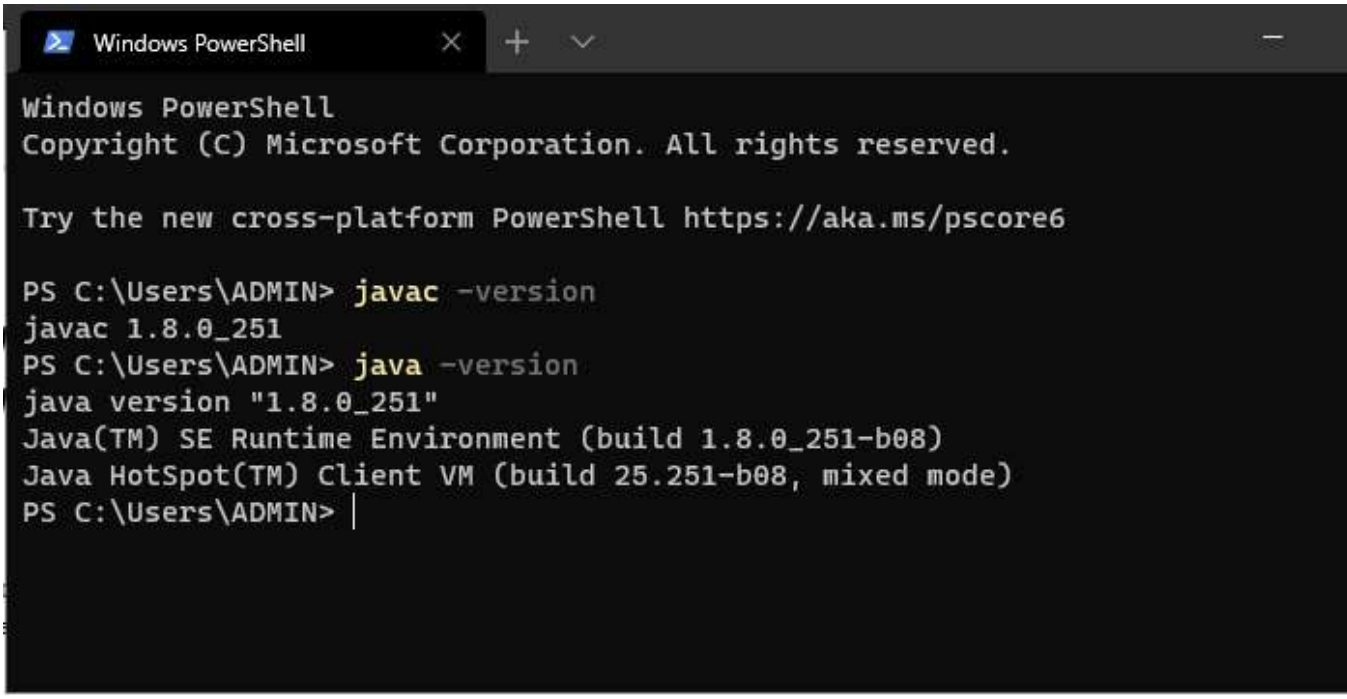
implementation is required as well as for Windows.

```
    }
}
```

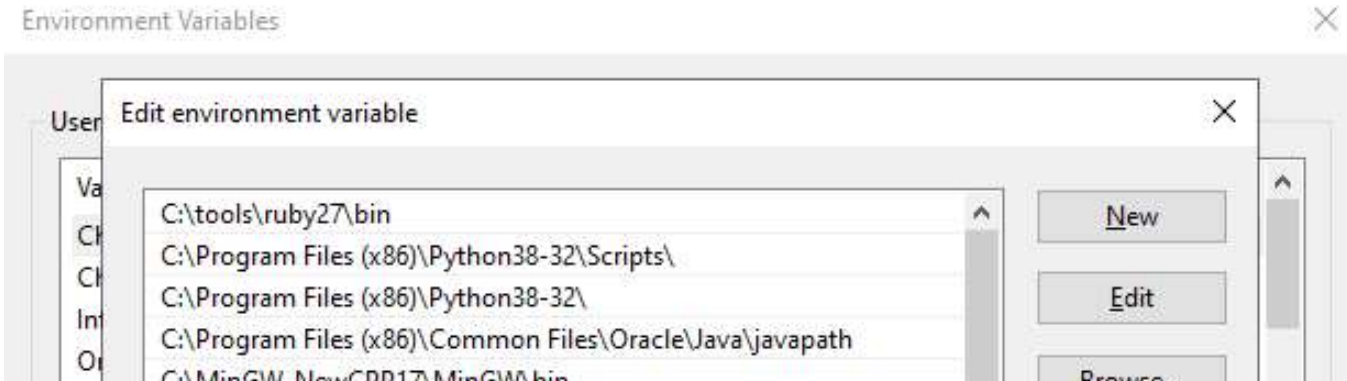
Steps:

1.1 Check whether latest version of Java (at least JDK 1.8) is installed or no and install it.

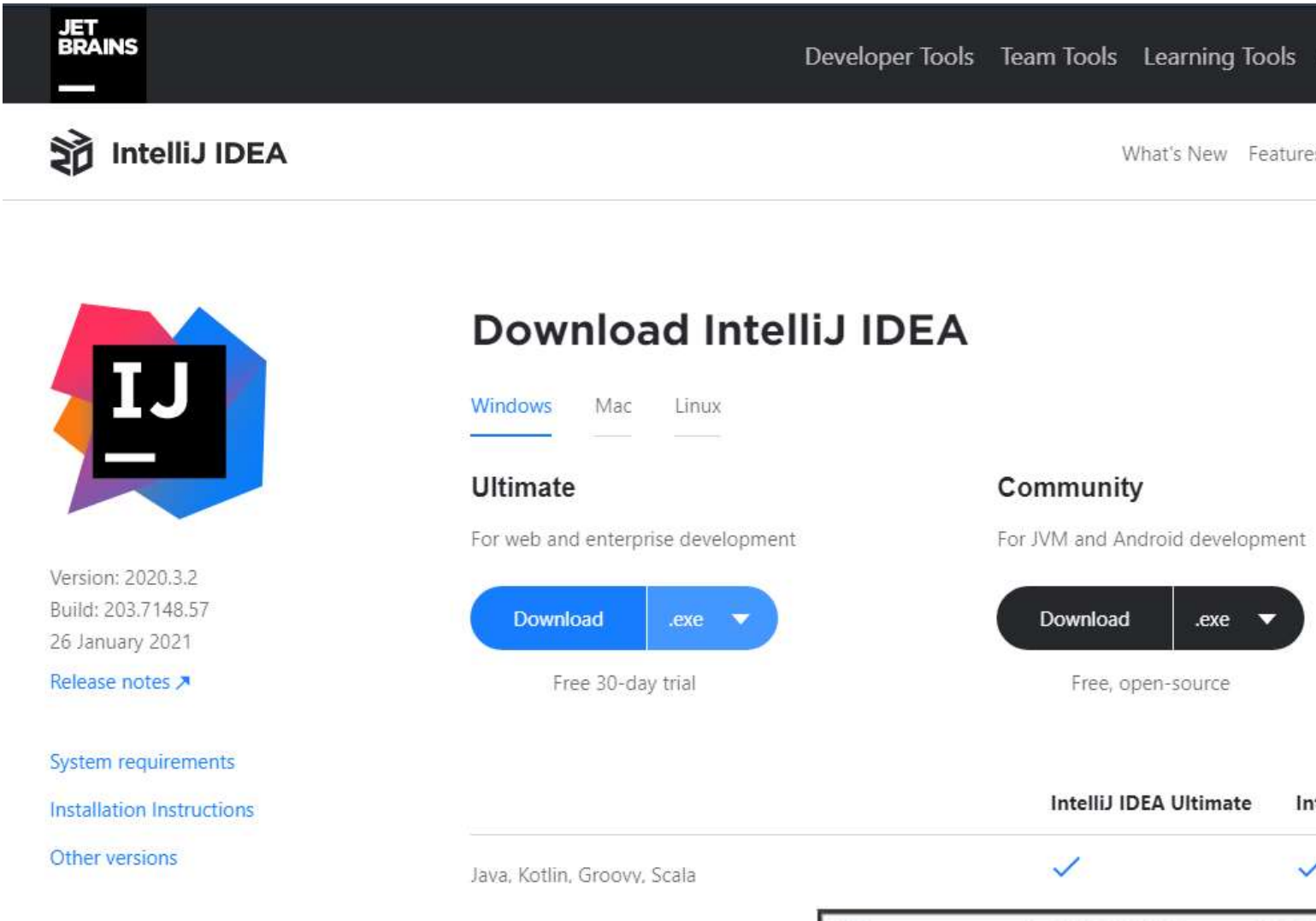
- Check if java compiler(javac) and jvm (java) are installed properly on
  Type these commands:
  javac -version
  java -version

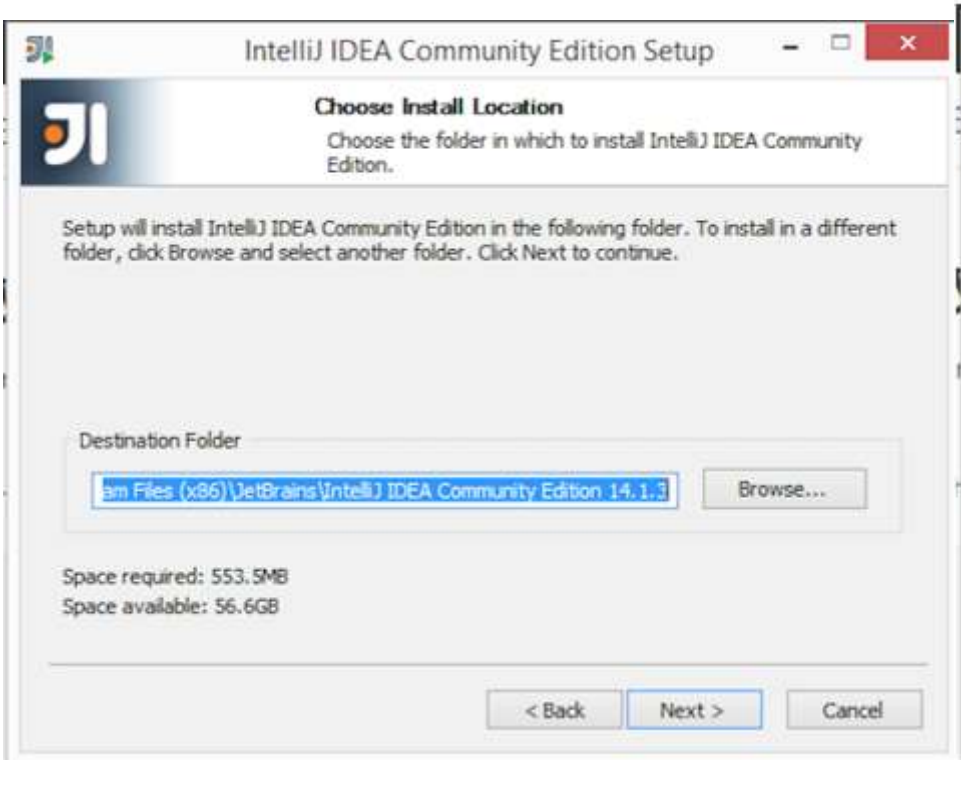


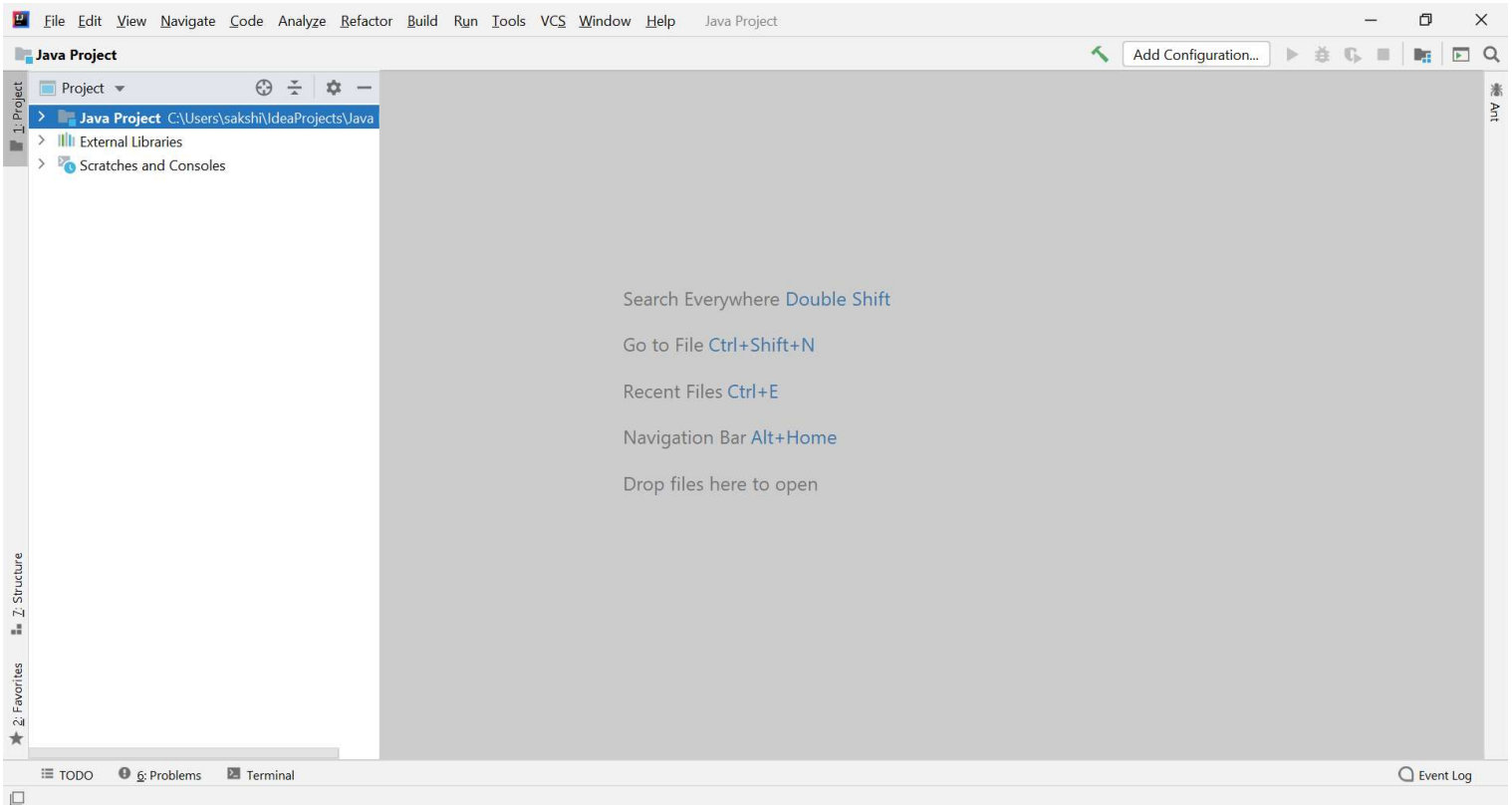
- If java compiler or jvm is not installed on system, download executibl
  execute to install JDK.
- Set environment variables to path where java is installed.



1.2 Download and install the IntelliJ IDEA Community Edition/ NetBeans later version of IDE







1.4 Create a Java class Person containing two variables name and yearOfB types, take inputs from the command line argument, a method to display th person.

```
public class Person
{
   String name;
   int yearOfBirth;

   public static void disp_details(String a,int b)
   {
     int current_year=2021;
     int age=current_year-b;
     System.out.println("name is "+a+" and age is "+age);

   }


   public static void main(String [] args )
   {
      disp_details("sakshi",2004);
```

	Find anything related to IntelliJ IDEA or your project and jump to it.
Ctrl+Shift+A	Find Action Find a command and execute it, open a tool window or s
Alt+Enter	Show intention actions and quick-fixes Fix highlighted error or warning, improve or optimize a c
F2 Shift+F2	Navigate between code issues Jump to the next or previous highlighted error.
Ctrl+E	View recent files Select a recently opened file from the list.
Ctrl+Shift+Enter	Complete current statement Insert any necessary trailing symbols and put the caret w typing the next statement.
Ctrl+Alt+L	Reformat code Reformat the whole file or the selected fragment accord code style settings.
Ctrl+Alt+Shift+T	Invoke refactoring Refactor the element under the caret, for example, safe rename, and so on.
Ctrl+W Ctrl+Shift+W	Extend or shrink selection Increase or decrease the scope of selection according to constructs.
Ctrl+/ Ctrl+Shift+/	Add/remove line or block comment Comment out a line or block of code.
Ctrl+B	Go to declaration Navigate to the initial declaration of the instantiated clas field.
Alt+F7	Find usages Show all places where a code element is used across you
Alt+1	Focus the Project tool window

Practical no. 2

Aim: Perform following programs.

2.1 Write a program to print “Hello World”.

2.2 Write a program to print addition of two integers.

2.3 Write a program to convert a numeric string into int.

2.4 Write a program to print addition of two integers input from comma

2.5 Write a program to take two integers from command line, subtract
the greater and print the result.

2.6 Write a program to take n integers from command line and print th
(product of first number and last number added to product of second n
number and so on).

2.7 Consider any two integers. Write a program to print sum of their sq

2.8 Write a program to find square root of a given positive integer using
square root.

2.9 Write a program to sort and print the names of students taken from
alphabetical order.

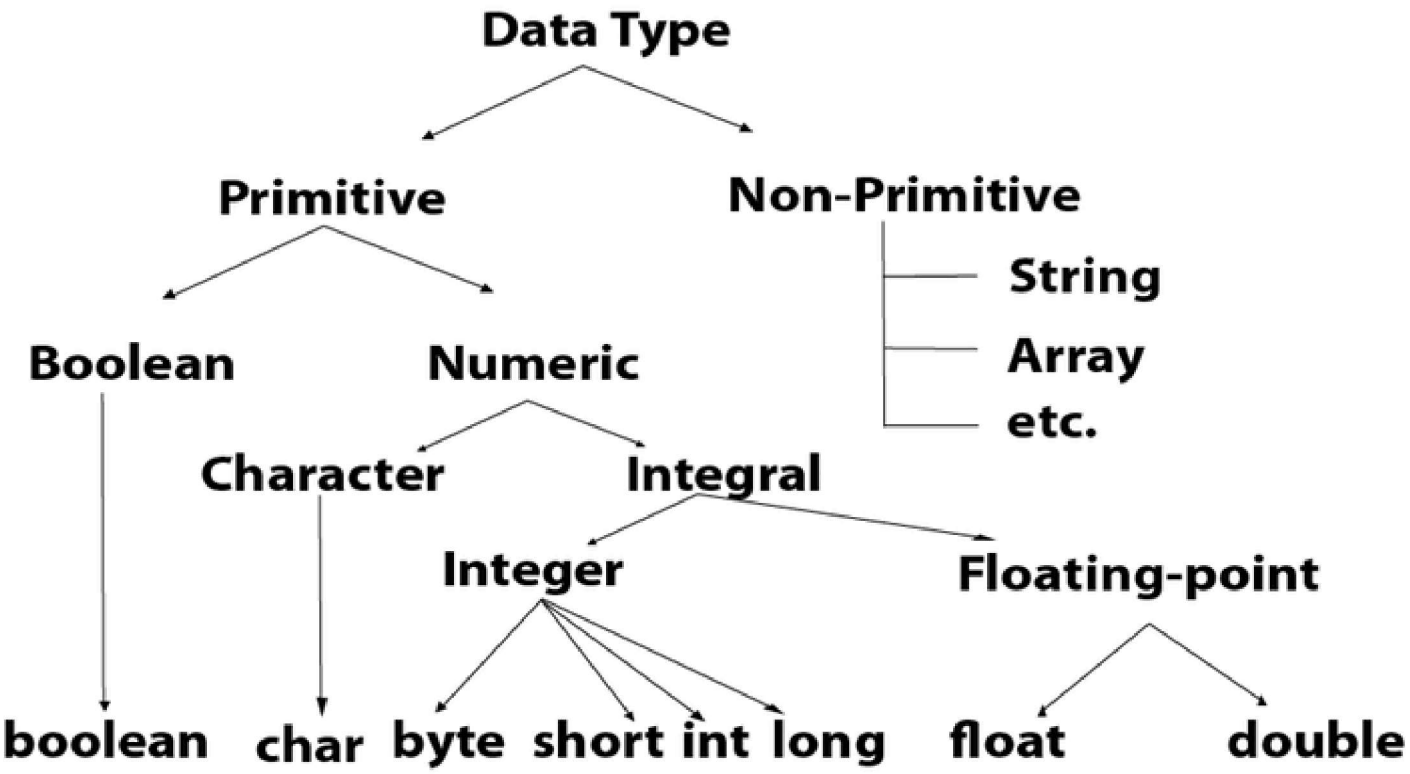
2.10 Write a program to print total numbers of vowels and consonants

2.11 Given two English words, write a program to check if the first word
word. (An anagram is a word or phrase formed by rearranging the lette
phrase, typically using all the original letters exactly once. (Example: An
RIDDLE is I AM LORD VOLDEMORT.)

2.12 Write a program to print a missing number in a sorted integer arra

2.13 Write a program to find all the pairs of numbers on an integer arra
given number.

- short data type
- int data type
- long data type
- float data type
- double data type



Boolean Data Type

The Boolean data type is used to store only two possible values: true and false. This data type is used for simple flags that t

The Boolean data type specifies one bit of information, but its "size" can't be defined precisely.

Example: Boolean one = false

Byte Data Type

The byte data type is an example of primitive data type. It isan 8-bit signed two's complement integer. Its value-range lies be
minimum value is -128 and maximum value is 127. Its default value is 0.

The byte data type is used to save memory in large arrays where the memory savings is most required. It saves space beca
integer. It can also be used in place of "int" data type.

Example: byte a = 10, byte b = -20

Short Data Type

The short data type is a 16-bit signed two's complement integer. Its value-range lies between -32,768 to 32,767 (inclusive). I
maximum value is 32,767. Its default value is 0.

Example: float f1 = 234.5f

Double Data Type

The double data type is a double-precision 64-bit IEEE 754 floating point. Its value range is unlimited. The double data type like float. The double data type also should never be used for precise values, such as currency. Its default value is 0.0d.

Example: double d1 = 12.3

Char Data Type

The char data type is a single 16-bit Unicode character. Its value-range lies between '\u0000' (or 0) to '\uffff' (or 65,535 inclus characters.

Example: char letterA = 'A'

Java Operators

In this tutorial, you'll learn about different types of operators in Java, their syntax and how to use

Operators are symbols that perform operations on variables and values. For example, `+` is an op while `*` is also an operator used for multiplication.
Operators in Java can be classified into 5 types:

1. Arithmetic Operators
2. Assignment Operators
3. Relational Operators
4. Logical Operators
5. Unary Operators
6. Bitwise Operators

---

1. Java Arithmetic Operators

Arithmetic operators are used to perform arithmetic operations on variables and data. For examp

Here, the `+` operator is used to add two variables `a` and `b`. Similarly, there are various other arithm

Operator	Operation

Here, `=` is the assignment operator. It assigns the value on its right to the variable on its left. That variable `age`.

Let's see some more assignment operators available in Java.

Operator	Example	Equivalent to
`=`	`a = b;`	`a = b;`
`+=`	`a += b;`	`a = a + b;`
`-=`	`a -= b;`	`a = a - b;`
`*=`	`a *= b;`	`a = a * b;`
`/=`	`a /= b;`	`a = a / b;`
`%=`	`a %= b;`	`a = a % b;`

3. Java Relational Operators

Relational operators are used to check the relationship between two operands. For example,

```
// check is a is less than b

a < b;
```

Here, `>` operator is the relational operator. It checks if `a` is less than `b` or not.

It returns either `true` or `false`.

Operator	Description	Example
`==`	Is Equal To	`3 == 5` returns **false**
`!=`	Not Equal To	`3 != 5` returns **true**
`>`	Greater Than	`3 > 5` returns **false**
`<`	Less Than	`3 < 5` returns **true**

Unary operators are used with only one operand. For example, `++` is a unary operator that increa
That is, `++5` will return **6**.
Different types of unary operators are:

Operator	Meaning
`+`	**Unary plus**: not necessary to use since numbers are positive without using it
`-`	**Unary minus**: inverts the sign of an expression
`++`	**Increment operator**: increments value by 1
`--`	**Decrement operator**: decrements value by 1
`!`	**Logical complement operator**: inverts the value of a boolean

Increment and Decrement Operators

Java also provides increment and decrement operators: `++` and `--` respectively. `++` increases the v
while `--` decrease it by **1**. For example,

```
int num = 5;

// increase num by 1

++num;
```

Here, the value of `num` gets increased to **6** from its initial value of **5**.

Example 5: Increment and Decrement Operators

In the above program, we have used the ++ and -- operator as **prefixes (++a, --b)**. We can also
(a++, b++).
There is a slight difference when these operators are used as prefix versus when they are used a

`<<`	Left Shift
`>>`	Right Shift
`>>>`	Unsigned Right Shift
`&`	Bitwise AND
`^`	Bitwise exclusive OR

These operators are not generally used in Java. To learn more, visit Java Bitwise and Bit Shift O

Other operators

Besides these operators, there are other additional operators in Java.

Java instanceof Operator

The `instanceof` operator checks whether an object is an instanceof a particular class.
Here, `str` is an instance of the `String` class. Hence, the `instanceof` operator returns `true`.

Java Ternary Operator

The ternary operator (conditional operator) is shorthand for the `if-then-else` statement. For example
variable = Expression ? expression1 : expression2
Here's how it works.

- If the Expression is true, expression1 is assigned to the variable.
- If the Expression is false, expression2 is assigned to the variable

Java Arrays

Arrays are used to store multiple values in a single variable, instead of declaring separate variables for each value

To declare an array, define the variable type with **square brackets**:

String[] cars;

We have now declared a variable that holds an array of strings. To insert values to it, we can use an array literal - place
inside curly braces:

Code:

2.1 Write a program to print “Hello World”.

Code:

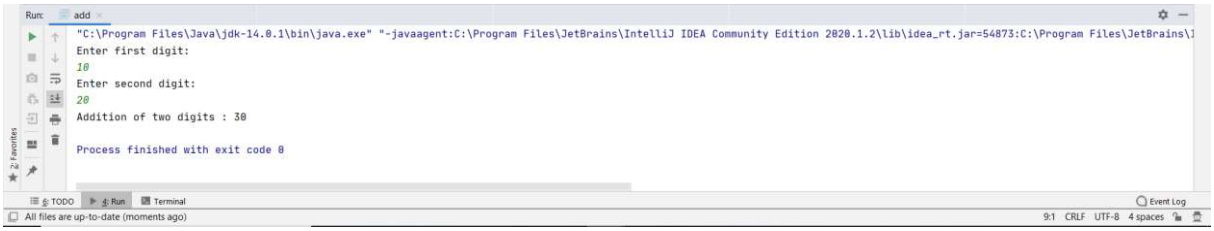
```
public class Hello {

    public static void main(String[] args) {
        System.out.println("Hello World !");
    }
}
```

Output:

2.2 Write a program to print addition of two integers.

Code:

```
import java.util.Scanner;
public class add {

    public static void main(String[] args) {

        Scanner scanner = new Scanner(System.in);

        System.out.println("Enter first digit:");

        int a = scanner.nextInt();
```

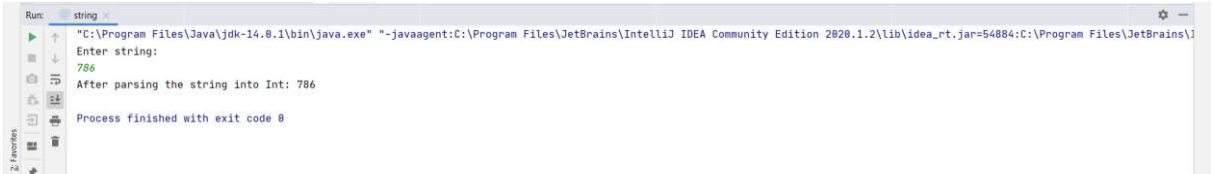


2.3 Write a program to convert a numeric string into int.

Code:

```
import java.util.Scanner;
public class string {

    public static void main(String[] args) {

        Scanner scanner = new Scanner(System.in);

        System.out.println("Enter string:");

        String s = scanner.nextLine();

        int number = Integer.parseInt(s);

        System.out.println("After parsing the string into Int: " + number);

    }

}
```

Output:



```
        num1 = Integer.parseInt(args[0]);

        num2 = Integer.parseInt(args[1]);
        sum = num1+num2;
        System.out.println(num1+" + "+num2+" = "+sum);
    }
}
```

Output:

2.5 Write a program to take two integers from command line, subtract the sm greater and print the result.

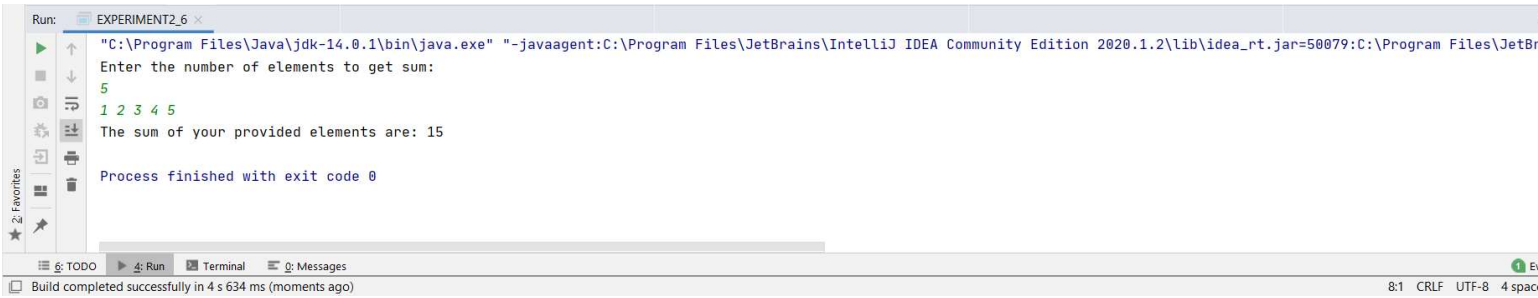
Code:

```
public class PR2_5 {

    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        int num1, num2;
         num1 = Integer.parseInt(args[0]);
         num2 = Integer.parseInt(args[1]);
        System.out.println(num1>num2 ? num1 +" - "+num2+" = "+(num1-num2)
"+(num2-num1));
    }
}
```

Output :

```
        System.out.println("Enter the number of elements to get sum:");

        int n = sc.nextInt();
        int [] arr = new int[n];
        int sum = 0;

        for(int k=0; k<arr.length; k++)
           arr[k] = sc.nextInt();

        for(int i=0; i<arr.length/2; i++){

            int result = arr[i] + arr[arr.length-1-i];
            sum += result;
        }

        if(n%2 != 0){
            int middleIndex = ((n-1)/2);
            sum += arr[middleIndex];
        }
        System.out.println("The sum of your provided elements are: "+sum);

    }
}
```

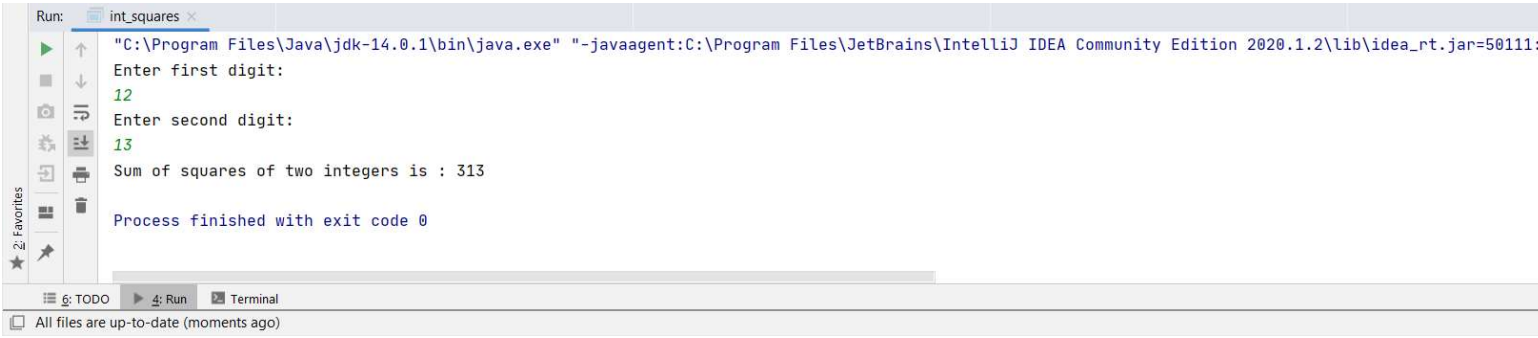
Output:



2.7 Consider any two integers. Write a program to print sum of their squares.

```
        d = c*c;
        e = b+d;
        System.out.println("Sum of squares of two integers is : " + e);
    }
}
```

Output:



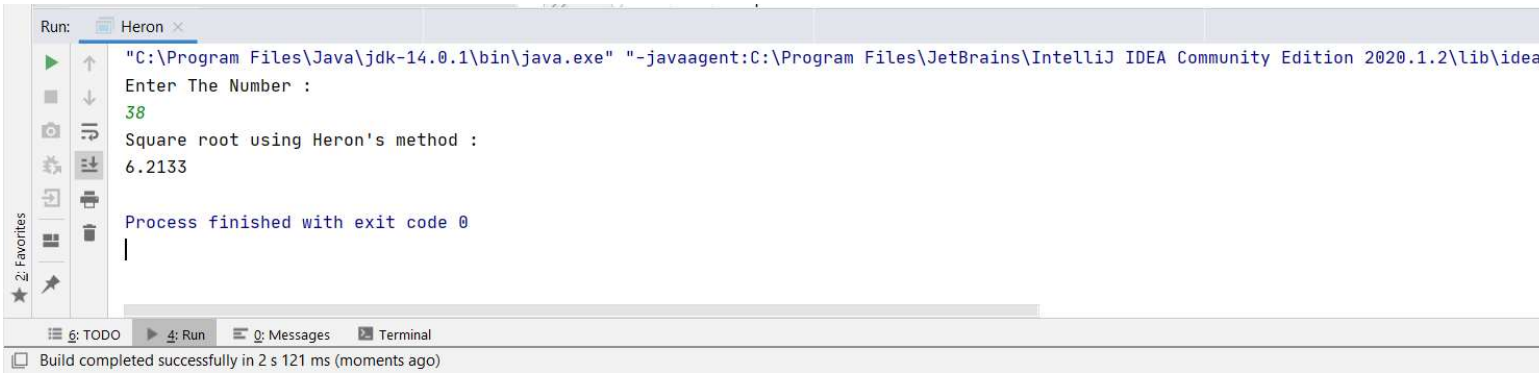
2.8 Write a program to find square root of a given positive integer using Hero root.

Code:

```
import java.util.Scanner;
public class Heron {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.println("Enter The Number : ");

        int a = scanner.nextInt();
        System.out.println((double)Math.round(heron(a) * 10000d) / 10000d);
    }

    public static int ClosetNumber(int a)   {
        int i;
```

```
        double a, i;
        a = ClosetNumber(x);
        for (i = 0; i < 4; i++)
            a = 0.5 * (a + x / a);
        return a;
    }
}
```

Output :



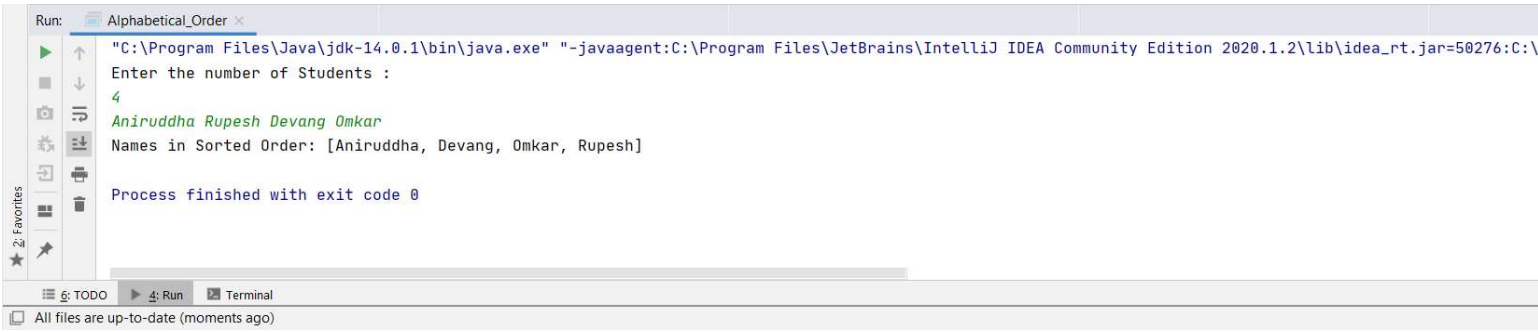
2.9 Write a program to sort and print the names of students taken from comm order.

Code :

```
import java.util.Scanner;
public class Alphabetical_Order
{
    public static void main(String[] args)
    {
        int n;
        String temp;
        Scanner s = new Scanner(System.in);
        System.out.print("Enter number of names you want to enter:");
        n = s.nextInt();
```

```
        System.out.print("Names in Sorted Order:");
        for (int i = 0; i < n - 1; i++)
        {
            System.out.print(names[i] + ",");
        }
        System.out.print(names[n - 1]);
    }
}
```

Output:



2.10 Write a program to print total numbers of vowels and consonants in a gi

Code:

```
import java.util.Scanner;


public class CountVowelConsonant {

    public static void main(String[] args) {

        Scanner sc = new Scanner(System.in);
        int vCount = 0, cCount = 0;
```

```
        System.out.println("Number of vowels: " + vCount);
        System.out.println("Number of consonants: " + cCount);
    }
}
```

Output:

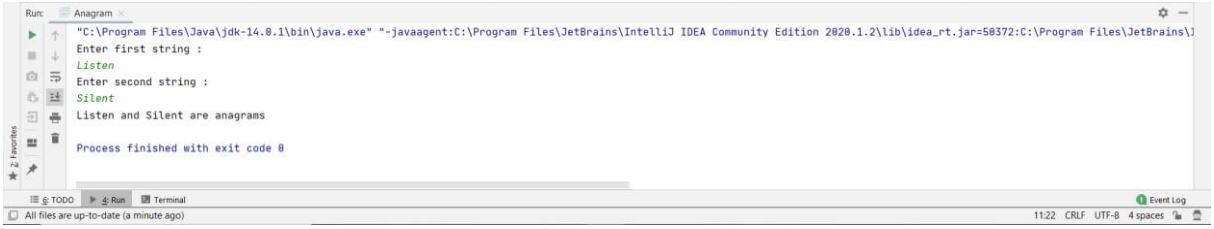
2.11 Given two English words, write a program to check if the first word is an word. (An anagram is a word or phrase formed by rearranging the letters of a phrase, typically using all the original letters exactly once. (Example: Anagram RIDDLE is I AM LORD VOLDEMORT.)

Code:

```
import java.util.Arrays;
import java.util.Scanner;

public class Anagram {

    static void areAnagram(String str1, String str2) {
        String s1 = str1.replaceAll("\\s", "");
        String s2 = str2.replaceAll("\\s", "");

        boolean status = true;
```

```
            System.out.println(str1 + " and " + str2 + " are not anagrams");
        }

        public static void main(String args[]) {
            Scanner in = new Scanner(System.in);
            System.out.println("Enter first string :");
            String str1 = in.nextLine();
            System.out.println("Enter second string :");
            String str2 = in.nextLine();
            areAnagram(str1, str2);
        }
}
```

Output:



```
        {
            mid = (a + b) / 2;
            if ((arr1[a] - a) != (arr1[mid] - mid))
                b = mid;
            else if ((arr1[b] - b) != (arr1[mid] - mid))
                a = mid;
        }
        return (arr1[mid] + 1);
    }
    public static void main (String[] args)
    {
        int array[] = { 1, 2, 3, 4, 6, 7, 8, 9, 10 };
        int size = array.length;
        System.out.println("Missing number: " + search(array, size));
    }

}
```

```java
import java.util.Scanner;


public class pairsCount {

   static void showPairs(int arr[], int n, int k) {

      for (int i = 0; i < n; i++)

         for (int j = i + 1; j < n; j++)

            if (arr[i] + arr[j] == k)

               System.out.println("(" + arr[i] + ", " + arr[j] + ")");

   }


   public static void main(String[] arg) {

      Scanner sc = new Scanner(System.in);

      System.out.println("Enter the number of elements you want to insert: ");

      int n = sc.nextInt();

      int arr[] = new int[n];

      for(int i=0; i<arr.length; i++){

         arr[i]=sc.nextInt();

      }
```

Conclusion: We understood and performed various programs using Ja

Practical no. 3

Aim:

3.1 Define the following classes/ interfaces with the help of above shortcu

1. Person(id, name, dateOfBirth, age, street, city, pin : default and pa
and setters and getters)

2. Department(id, name, dateOfEstablishment, headOfficeLocation, h
numberOfEmployees : default and parameterized constructors and s

3. Point(x, y, z : default and parameterized constructors and setters a

4. Vehicle(registrationNumber, rcBookNumber, manufacturer, numb
model, numberOfSeats : default and parameterized constructors and

5. Laptop(imeiNumber, processorName, processorSpeed, primaryMe
primaryMemoryCapacity, secondaryStorageType, secondaryStorageC
screenResolution, screenType, isLED, listOfPorts, osInstalled : default
constructors and setters and getters)

6. interface Taxable(public int cost(), public intpercentGST())

3.2 Check whether feature of Encapsulation has been followed in 3.1. If no
changes.

3.3 Define classes Car, Train and Truck with necessary member fields, cons
Make them extend class Vehicle.

3.4 Define a class Gadget with necessary member fields, constrictors and m
Laptop to extend the class Gadget.

3.5 In main method, declare a reference variable vehicle of class Vehicle a
class Car which will be referenced by vehicle. Call getName() method on th
Variable Casting)

3.6 Modify the classes Vehicle and Gadget implement the interface Taxabl
respective methods.

- Instance
- Method
- Message Passing

Object − Objects have states and behaviors. Example: A dog has states - color, name, breed the tail, barking, eating. An object is an instance of a class.

Class − A class can be defined as a template/blueprint that describes the behavior/state that

Objects in Java

Let us now look deep into what are objects. If we consider the real-world, we can find many humans, etc. All these objects have a state and a behavior.

If we consider a dog, then its state is - name, breed, color, and the behavior is - barking, wag

If you compare the software object with a real-world object, they have very similar characteris

Software objects also have a state and a behavior. A software object's state is stored in fie methods.

So in software development, methods operate on the internal state of an object and the obj done via methods.

Classes in Java

A class is a blueprint from which individual objects are created.

Following is a sample of a class.

Example

```
public class Dog {
   String breed;
   int age;
   String color;
   void barking() {
   }
   void hungry() {
   }
   void sleeping() {
   }
}
```

A class can contain any of the following variable types.

```
public class Puppy {
  public Puppy() {
  }

  public Puppy(String name) {
    // This constructor has one parameter, name.
  }
}
```

Java also supports Singleton Classes where you would be able to create only one instance c

Note − We have two different types of constructors. We are going to discuss constructors in de

Creating an Object

As mentioned previously, a class provides the blueprints for objects. So basically, an object is the new keyword is used to create new objects.

There are three steps when creating an object from a class −

- **Declaration −** A variable declaration with a variable name with an object type.
- **Instantiation −** The 'new' keyword is used to create the object.
- **Initialization −** The 'new' keyword is followed by a call to a constructor. This call initializ

An interface is a reference type in Java. It is similar to class. It is a collection of abstract methods. A clas inheriting the abstract methods of the interface.

Along with abstract methods, an interface may also contain constants, default methods, static methods, and only for default methods and static methods.

Writing an interface is similar to writing a class. But a class describes the attributes and behaviors of an object that a class implements.

Unless the class that implements the interface is abstract, all the methods of the interface need to be defined

An interface is similar to a class in the following ways −

- An interface can contain any number of methods.
- An interface is written in a file with a **.java** extension, with the name of the interface matching the nam
- The byte code of an interface appears in a **.class** file.
- Interfaces appear in packages, and their corresponding bytecode file must be in a directory structure t

However, an interface is different from a class in several ways, including −

- You cannot instantiate an interface.
- An interface does not contain any constructors.
- All of the methods in an interface are abstract.
- An interface cannot contain instance fields. The only fields that can appear in an interface must be de

- An interface is implicitly abstract. You do not need to use the **abstract** keyword while declaring an inte
- Each method in an interface is also implicitly abstract, so the abstract keyword is not needed.
- Methods in an interface are implicitly public.

Example

```
/* File name : Animal.java */

interface Animal {

   public void eat();

   public void travel();

}
```

Implementing Interfaces

When a class implements an interface, you can think of the class as signing a contract, agreeing to perform th
If a class does not perform all the behaviors of the interface, the class must declare itself as abstract.

A class uses the **implements** keyword to implement an interface. The implements keyword appears in the cla
portion of the declaration.

Example

```
/* File name : MammalInt.java */

public class MammalInt implements Animal {

   public void eat() {

      System.out.println("Mammal eats");

   }

   public void travel() {

      System.out.println("Mammal travels");

   }

   public int noOfLegs() {

      return 0;

   }

   public static void main(String args[]) {

      MammalInt m = new MammalInt();
```

- An interface can extend another interface, in a similar way as a class can extend another class.

Extending Interfaces

An interface can extend another interface in the same way that a class can extend another class. The **ext** interface, and the child interface inherits the methods of the parent interface.

The following Sports interface is extended by Hockey and Football interfaces.

Example

```
// Filename: Sports.java

public interface Sports {

   public void setHomeTeam(String name);

   public void setVisitingTeam(String name);

}



// Filename: Football.java

public interface Football extends Sports {

   public void homeTeamScored(int points);

   public void visitingTeamScored(int points);

   public void endOfQuarter(int quarter);

}

// Filename: Hockey.java

public interface Hockey extends Sports {

   public void homeGoalScored();

   public void visitingGoalScored();

   public void endOfPeriod(int period);

   public void overtimePeriod(int ot);

}
```

The Hockey interface has four methods, but it inherits two from Sports; thus, a class that implements Hockey Similarly, a class that implements Football needs to define the three methods from Football and the two metl

Extending Multiple Interfaces

```
class Person {

    int dateOfBirth, age, id, pin;
    String name, street, city;

    Person() {

    }

    Person(int a, int b, int c, int d, String s, String s2, String s3) {
        this.dateOfBirth = c;
        this.age = b;
        this.id = a;
        this.pin = d;
        this.name = s;
        this.street = s2;
        this.city = s3;
    }

    public int getDateOfBirth() {
        return dateOfBirth;
    }

    public void setDateOfBirth(int dateOfBirth) {
        this.dateOfBirth = dateOfBirth;
    }

    public String getCity() {
        return city;
    }

    public void setCity(String city) {
        this.city = city;
    }

    public String getStreet() {
        return street;
    }

    public void setStreet(String street) {
        this.street = street;
    }

    public int getPin() {
        return pin;
    }

    public void setPin(int pin) {
        this.pin = pin;
    }

    public String getName() {
        return name;
    }

    public void setName(String name) {
        this.name = name;
    }

    public int getId() {
        return id;
    }

    public void setId(int id) {
        this.id = id;
    }
```

```
        this.dateOfEstablishment = dateOfEstablishment;
        this.headOfficeLocation = headOfficeLocation;
        this.name = name;
    }

    public int getId() {
        return id;
    }

    public void setId(int id) {
        this.id = id;
    }

    public int getHeadId() {
        return headId;
    }

    public void setHeadId(int headId) {
        this.headId = headId;
    }

    public int getNumberOfEmployees() {
        return numberOfEmployees;
    }

    public void setNumberOfEmployees(int numberOfEmployees) {
        this.numberOfEmployees = numberOfEmployees;
    }

    public int getDateOfEstablishment() {
        return dateOfEstablishment;
    }

    public void setDateOfEstablishment(int dateOfEstablishment) {
        this.dateOfEstablishment = dateOfEstablishment;
    }

    public String getHeadOfficeLocation() {
        return headOfficeLocation;
    }

    public void setHeadOfficeLocation(String headOfficeLocation) {
        this.headOfficeLocation = headOfficeLocation;
    }

    public String getName() {
        return name;
    }

    public void setName(String name) {
        this.name = name;
    }


}
```

Point(x, y, z : default and parameterized constructors and setters and getter

Code :

```
class Point {
    int x, y, z;

    Point() {
```

```
}
```

4. Vehicle(registrationNumber, rcBookNumber, manufacturer, numberOfW
model, numberOfSeats : default and parameterized constructors and setter

Code :

```
class Vehicle implements Taxable {
    int registrationNumber, rcBookNumber, manufacturer, numberOfWheels, numberOfSeats;
    String vehicleType, model, name;
    int cost;

    Vehicle() {

    }

    public Vehicle(int registrationNumber, int rcBookNumber, int manufacturer, int numberOfWheel
vehicleType, String model) {
        this.registrationNumber = registrationNumber;
        this.rcBookNumber = rcBookNumber;
        this.manufacturer = manufacturer;
        this.numberOfWheels = numberOfWheels;
        this.numberOfSeats = numberOfSeats;
        this.vehicleType = vehicleType;
        this.model = model;
    }

    public int getCost() {
        return cost;
    }

    public void setCost(int cost) {
        this.cost = cost;
    }

    public String getName() {
        return name;
    }

    public void setName(String name) {
        this.name = name;
    }

    public int getRegistrationNumber() {
        return registrationNumber;
    }

    public void setRegistrationNumber(int registrationNumber) {
        this.registrationNumber = registrationNumber;
    }

    public int getRcBookNumber() {
        return rcBookNumber;
    }

    public void setRcBookNumber(int rcBookNumber) {
        this.rcBookNumber = rcBookNumber;
    }

    public int getManufacturer() {
        return manufacturer;
    }
```

```
    }

    public void setModel(String model) {
        this.model = model;
    }


    public int cost() {
        int cost = getCost();
        return cost;
    }

    public int percentGST() {
        float a = 0.18f;
        int percentGST = (int) (getCost() + (getCost() * a));
        return percentGST;
    }


}
```

5. Laptop(imeiNumber, processorName, processorSpeed, primaryMemory' primaryMemoryCapacity, secondaryStorageType, secondaryStorageCapac screenType, isLED, listOfPorts, osInstalled : default and parameterized co and getters)

Code :

```
class Laptop extends Gadget {
    int imeiNumber;
    String processorName, primaryMemoryType, secondaryStorageType, screenType;
    boolean isLED, osInstalled;
    float processorSpeed, primaryMemoryCapacity, secondaryStorageCapaciry, screenResolution;
    String listOfPorts;
    int cost;

    Laptop() {

    }

    public Laptop(int imeiNumber, String processorName, String primaryMemoryType, String seconda
screenType, boolean isLED, boolean osInstalled, float processorSpeed, float primaryMemoryCapacit
secondaryStorageCapaciry, float screenResolution, String listOfPorts) {
        this.imeiNumber = imeiNumber;
        this.processorName = processorName;
        this.primaryMemoryType = primaryMemoryType;
        this.secondaryStorageType = secondaryStorageType;
        this.screenType = screenType;
        this.isLED = isLED;
        this.osInstalled = osInstalled;
        this.processorSpeed = processorSpeed;
        this.primaryMemoryCapacity = primaryMemoryCapacity;
        this.secondaryStorageCapaciry = secondaryStorageCapaciry;
        this.screenResolution = screenResolution;
        this.listOfPorts = listOfPorts;

    }

    public boolean isLED() {
        return isLED;
    }
```

```
public String getPrimaryMemoryType() {
    return primaryMemoryType;
}

public void setPrimaryMemoryType(String primaryMemoryType) {
    this.primaryMemoryType = primaryMemoryType;
}

public String getSecondaryStorageType() {
    return secondaryStorageType;
}

public void setSecondaryStorageType(String secondaryStorageType) {
    this.secondaryStorageType = secondaryStorageType;
}

public String getScreenType() {
    return screenType;
}

public void setScreenType(String screenType) {
    this.screenType = screenType;
}

public boolean getIsLED() {
    return isLED;
}

public void setIsLED(Boolean isLED) {
    this.isLED = isLED;
}

public boolean getOsInstalled() {
    return osInstalled;
}

public void setOsInstalled(boolean osInstalled) {
    this.osInstalled = osInstalled;
}

public void setOsInstalled(Boolean osInstalled) {
    this.osInstalled = osInstalled;
}

public float getProcessorSpeed() {
    return processorSpeed;
}

public void setProcessorSpeed(float processorSpeed) {
    this.processorSpeed = processorSpeed;
}

public float getPrimaryMemoryCapacity() {
    return primaryMemoryCapacity;
}

public void setPrimaryMemoryCapacity(float primaryMemoryCapacity) {
    this.primaryMemoryCapacity = primaryMemoryCapacity;
}

public float getSecondaryStorageCapaciry() {
    return secondaryStorageCapaciry;
}

public void setSecondaryStorageCapaciry(float secondaryStorageCapaciry) {
    this.secondaryStorageCapaciry = secondaryStorageCapaciry;
}
```

```
        return percentGST;
    }

}
```

6. interface Taxable(public int cost(), public intpercentGST())

Code :

```
interface Taxable {
    int cost();

    int percentGST();
}
```

3.2 Check whether feature of Encapsulation has been followed in 3.1. If not changes.

Code :

```
public class Main {
    public static void main(String[] args) {
        Person person = new Person();
        person.setAge(45);
        person.setId(01);
        person.setName("Max");
        person.setDateOfBirth(19);
        person.setStreet("Mira road");
        person.setCity("Mumbai");
        person.setPin(409614);
        System.out.println(" id " + person.getId() + "\n name " + person.getName() + "\n age " +
birth " + person.getDateOfBirth() + "\n street name " + person.getStreet() + "\n city name " + p
+ person.getPin());
    }
}
```

Output :

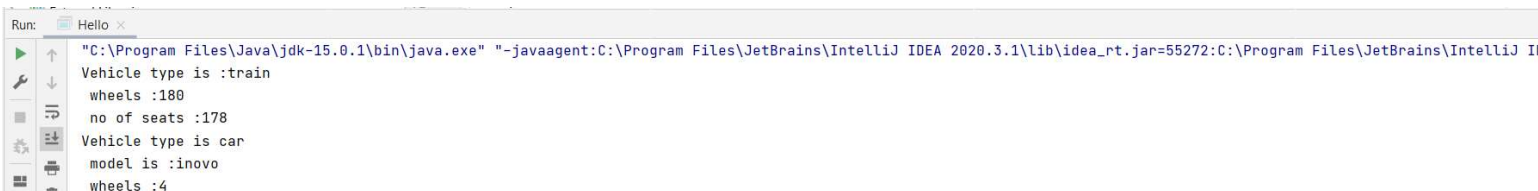
3.3 Define classes Car, Train and Truck with necessary member fields, cons
Make them extend class Vehicle

```
    public int percentGST() {
        float a = 0.18f;
        int percentGST = (int) (getCost() + (getCost() * a));
        return percentGST;
    }
}



class Train extends Vehicle {
    void show() {
        System.out.println("vehicle type is :" + getVehicleType() + "\n wheels :" + getNumberOfW
                + "\n no of seats :" + getNumberOfSeats() + "");
    }


}



class Truck extends Vehicle {


    void show() {
        System.out.println("vehicle type is :" + getVehicleType() + "\n wheels :" + getNumberOfW
                + "\n no of seats :" + getNumberOfSeats() + "");
    }
}
```

Main method :

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

    Train h = new Train();
    h.setVehicleType("train");
    h.setNumberOfSeats(178);
    h.setNumberOfWheels(180);
    h.setRegistrationNumber(90764);
    h.show();

    Car c = new Car();
    c.setVehicleType("car");
    c.setModel("inovo");
    c.setNumberOfSeats(5);
    c.setNumberOfWheels(4);
    c.setRegistrationNumber(90671);
    c.show();

    Truck t = new Truck();
    t.setVehicleType("truck");
    t.setNumberOfSeats(3);
    t.setNumberOfWheels(6);
    t.show();
}
```

Output :

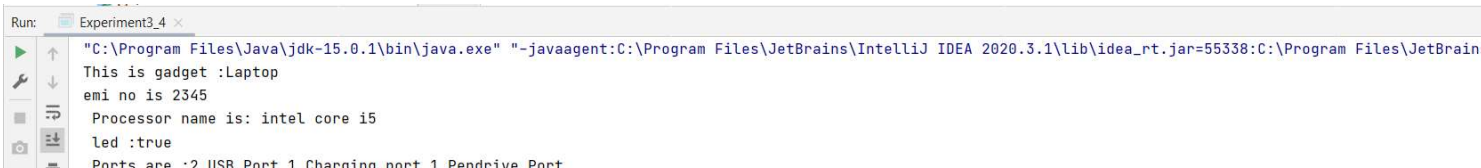


```
        this.gadgetName = gadgetName;
    }

    void disp() {
        System.out.println("The object of a class Gadget is initialized " + gadgetcount + " time
    }

    public String getGadgetName() {
        return gadgetName;
    }

    public void setGadgetName(String gadgetName) {
        this.gadgetName = gadgetName;
    }

    public int getCost() {
        return cost;
    }

    public void setCost(int cost) {
        this.cost = cost;
    }

    void Show() {
        System.out.println("This is gadget :" + getGadgetName());

    }


    public int cost() {
        int cost = getCost();
        return cost;
    }

    public int percentGST() {
        float a = 0.18f;
        int percentGST = (int) (getCost() + (getCost() * a));
        return percentGST;
    }

}
```

Main method :

```
public static void main(String args[]) {
    Laptop l = new Laptop();
    l.setGadgetName("Laptop");
    l.setImeiNumber(2345);
    l.setIsLED(true);
    l.setListOfPorts("2 USB Port,1 Charging port,1 Pendrive Port");
    l.setOsInstalled(true);
    l.setPrimaryMemoryCapacity(1500);
    l.setProcessorName("intel core i5");
    l.Show();
    l.print();
}
```

Output :



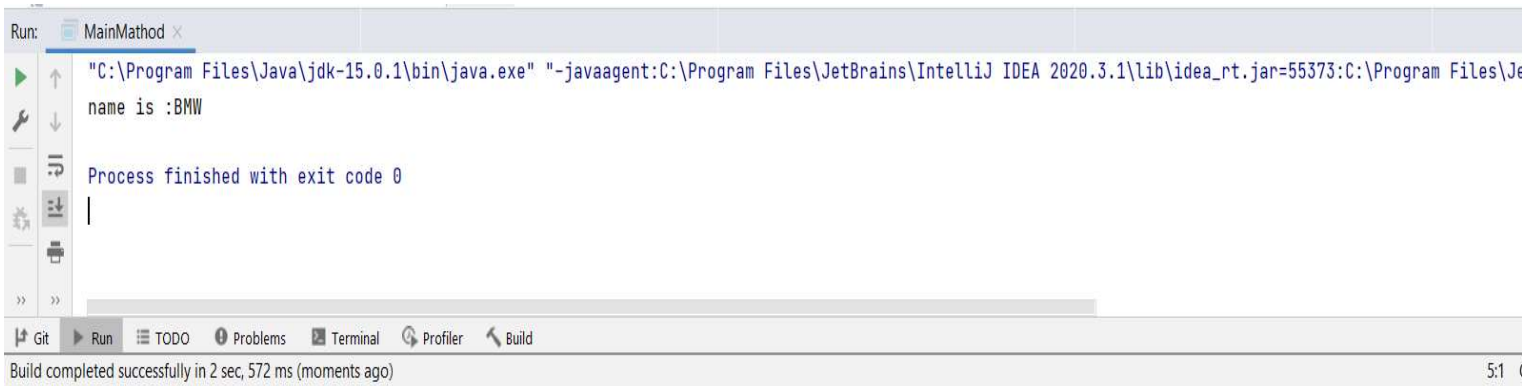
```
        this.registrationNumber = registrationNumber;
        this.rcBookNumber = rcBookNumber;
        this.manufacturer = manufacturer;
        this.numberOfWheels = numberOfWheels;
        this.numberOfSeats = numberOfSeats;
        this.vehicleType = vehicleType;
        this.model = model;
    }

    public int getCost() {
        return cost;
    }

    public void setCost(int cost) {
        this.cost = cost;
    }

    public String getName() {
        return name;
    }

    public void setName(String name) {
        this.name = name;
    }

    public int getRegistrationNumber() {
        return registrationNumber;
    }

    public void setRegistrationNumber(int registrationNumber) {
        this.registrationNumber = registrationNumber;
    }

    public int getRcBookNumber() {
        return rcBookNumber;
    }

    public void setRcBookNumber(int rcBookNumber) {
        this.rcBookNumber = rcBookNumber;
    }

    public int getManufacturer() {
        return manufacturer;
    }

    public void setManufacturer(int manufacturer) {
        this.manufacturer = manufacturer;
    }

    public int getNumberOfWheels() {
        return numberOfWheels;
    }

    public void setNumberOfWheels(int numberOfWheels) {
        this.numberOfWheels = numberOfWheels;
    }

    public int getNumberOfSeats() {
        return numberOfSeats;
    }

    public void setNumberOfSeats(int numberOfSeats) {
        this.numberOfSeats = numberOfSeats;
    }

    public String getVehicleType() {
        return vehicleType;
```

```
class Car extends Vehicle {
    int cost;

    @Override
    public int getCost() {
        return cost;
    }

    @Override
    public void setCost(int cost) {
        this.cost = cost;
    }

    void show() {
        System.out.println("Vehicle type is " + getVehicleType() + "\n model is :" + getModel()
getNumberOfWheels()
                + "\n no of seats :" + getNumberOfSeats() + "");
    }

    void disp() {
        System.out.println("name is :" + getName());
    }

    public int cost() {
        int cost = getCost();
        return cost;
    }

    public int percentGST() {
        float a = 0.18f;
        int percentGST = (int) (getCost() + (getCost() * a));
        return percentGST;
    }
}
```

Main method :

```
public static void main(String [] args)
{
    Vehicle vehicle;
    Car c1=new Car();
    c1.setName("BMW");
    c1.disp();

}
```

Output :



3.6 Modify the classes Vehicle and Gadget implement the interface Taxable

```
    public String getGadgetName() {
        return gadgetName;
    }

    public void setGadgetName(String gadgetName) {
        this.gadgetName = gadgetName;
    }

    public int getCost() {
        return cost;
    }

    public void setCost(int cost) {
        this.cost = cost;
    }

    void Show() {
        System.out.println("This is gadget :" + getGadgetName());

    }


    public int cost() {
        int cost = getCost();
        return cost;
    }

    public int percentGST() {
        float a = 0.18f;
        int percentGST = (int) (getCost() + (getCost() * a));
        return percentGST;
    }

}


class Vehicle implements Taxable {
    int registrationNumber, rcBookNumber, manufacturer, numberOfWheels, numberOfSeats;
    String vehicleType, model, name;
    int cost;

    Vehicle() {

    }

    public Vehicle(int registrationNumber, int rcBookNumber, int manufacturer, int numberOfWheel
vehicleType, String model) {
        this.registrationNumber = registrationNumber;
        this.rcBookNumber = rcBookNumber;
        this.manufacturer = manufacturer;
        this.numberOfWheels = numberOfWheels;
        this.numberOfSeats = numberOfSeats;
        this.vehicleType = vehicleType;
        this.model = model;
    }

    public int getCost() {
        return cost;
    }

    public void setCost(int cost) {
        this.cost = cost;
    }

    public String getName() {
```

```
        return numberOfWheels;
    }

    public void setNumberOfWheels(int numberOfWheels) {
        this.numberOfWheels = numberOfWheels;
    }

    public int getNumberOfSeats() {
        return numberOfSeats;
    }

    public void setNumberOfSeats(int numberOfSeats) {
        this.numberOfSeats = numberOfSeats;
    }

    public String getVehicleType() {
        return vehicleType;
    }

    public void setVehicleType(String vehicleType) {
        this.vehicleType = vehicleType;
    }

    public String getModel() {
        return model;
    }

    public void setModel(String model) {
        this.model = model;
    }


    public int cost() {
        int cost = getCost();
        return cost;
    }

    public int percentGST() {
        float a = 0.18f;
        int percentGST = (int) (getCost() + (getCost() * a));
        return percentGST;
    }


}
```

Main method :

```
public static void main(String args[]) {
    Gadget g = new Gadget();
    g.setCost(15000);
    Vehicle v = new Vehicle();
    v.setCost(55000);
    System.out.println("cost price of gadget is " + g.cost() + "/-");
    System.out.println("selling price of gadget after applying 18% GST is " + g.percentGST() + "
    System.out.println();
    System.out.println("cost price of vehicle is " + v.cost() + "/-");
    System.out.println("selling price of vehicle after applying 18% GST is " + g.percentGST() +

}
```

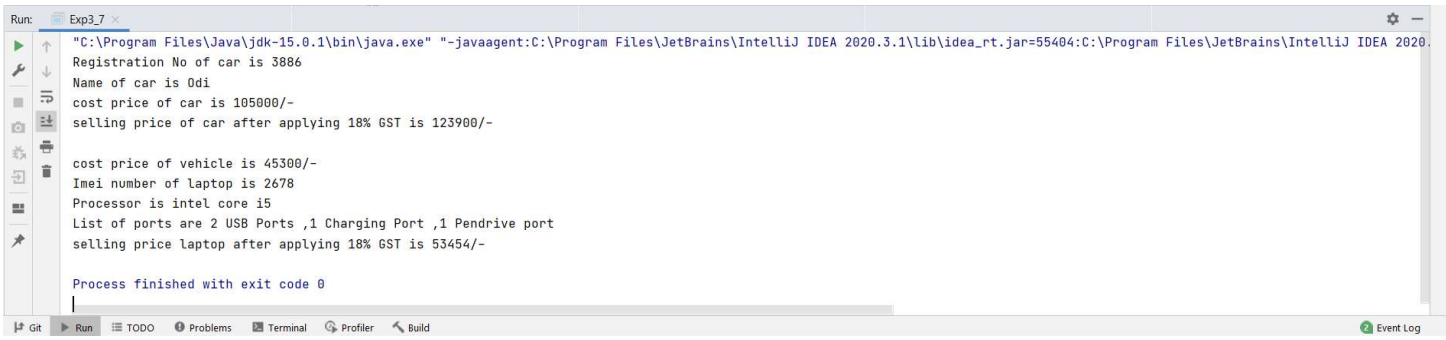
Output :

```
screenType, boolean isLED, boolean osInstalled, float processorSpeed, float primaryMemoryCapacit
secondaryStorageCapaciry, float screenResolution, String listOfPorts) {
        this.imeiNumber = imeiNumber;
        this.processorName = processorName;
        this.primaryMemoryType = primaryMemoryType;
        this.secondaryStorageType = secondaryStorageType;
        this.screenType = screenType;
        this.isLED = isLED;
        this.osInstalled = osInstalled;
        this.processorSpeed = processorSpeed;
        this.primaryMemoryCapacity = primaryMemoryCapacity;
        this.secondaryStorageCapaciry = secondaryStorageCapaciry;
        this.screenResolution = screenResolution;
        this.listOfPorts = listOfPorts;

    }

    public boolean isLED() {
        return isLED;
    }

    public void setLED(boolean LED) {
        isLED = LED;
    }

    public boolean isOsInstalled() {
        return osInstalled;
    }

    public int getCost() {
        return cost;
    }

    public void setCost(int cost) {
        this.cost = cost;
    }

    public int getImeiNumber() {
        return imeiNumber;
    }

    public void setImeiNumber(int imeiNumber) {
        this.imeiNumber = imeiNumber;
    }

    public String getProcessorName() {
        return processorName;
    }

    public void setProcessorName(String processorName) {
        this.processorName = processorName;
    }

    public String getPrimaryMemoryType() {
        return primaryMemoryType;
    }

    public void setPrimaryMemoryType(String primaryMemoryType) {
        this.primaryMemoryType = primaryMemoryType;
    }

    public String getSecondaryStorageType() {
        return secondaryStorageType;
    }

    public void setSecondaryStorageType(String secondaryStorageType) {
        this.secondaryStorageType = secondaryStorageType;
```

```
        return processorSpeed;
    }

    public void setProcessorSpeed(float processorSpeed) {
        this.processorSpeed = processorSpeed;
    }

    public float getPrimaryMemoryCapacity() {
        return primaryMemoryCapacity;
    }

    public void setPrimaryMemoryCapacity(float primaryMemoryCapacity) {
        this.primaryMemoryCapacity = primaryMemoryCapacity;
    }

    public float getSecondaryStorageCapaciry() {
        return secondaryStorageCapaciry;
    }

    public void setSecondaryStorageCapaciry(float secondaryStorageCapaciry) {
        this.secondaryStorageCapaciry = secondaryStorageCapaciry;
    }

    public float getScreenResolution() {
        return screenResolution;
    }

    public void setScreenResolution(float screenResolution) {
        this.screenResolution = screenResolution;
    }

    public String getListOfPorts() {
        return listOfPorts;
    }

    public void setListOfPorts(String listOfPorts) {
        this.listOfPorts = listOfPorts;
    }

    void print() {
        System.out.println("emi no is " + getImeiNumber() + "\n Processor name is: " + getProces
getIsLED() + "\n Ports are :" + getListOfPorts() + "\n OS :" + getOsInstalled() + "\n Meomory Ca
getPrimaryMemoryCapacity());
    }

    public int cost() {
        int cost = getCost();
        return cost;
    }

    public int percentGST() {
        float a = 0.18f;
        int percentGST = (int) (getCost() + (getCost() * a));
        return percentGST;
    }

}



class Car extends Vehicle {
    int cost;

    @Override
    public int getCost() {
        return cost;
    }
```

```
    Car c=new Car();
    c.setName("Odi");
    c.setCost(105000);
    c.setRegistrationNumber(07456);
    Laptop l=new Laptop();
    l.setCost(45300);
    l.setProcessorName("intel core i5");
    l.setImeiNumber(2678);
    l.setListOfPorts("2 USB Ports ,1 Charging Port ,1 Pendrive port ");
    System.out.println("Registration No of car is "+c.getRegistrationNumber()+"\nName of car is
car is "+c.cost()+"/-");
    System.out.println("selling price of car after applying 18% GST is "+c.percentGST()+"/-");
    System.out.println();
    System.out.println("cost price of vehicle is "+l.cost()+"/-");
    System.out.println("Imei number of laptop is "+l.getImeiNumber()+"\nProcessor is "+l.getProc
"+l.getListOfPorts()+"\nselling price laptop after applying 18% GST is "+l.percentGST()+"/-");


}
```

Output :



3.8 Modify the class Gadget to add a data member gadgetCount such that i as soon as a new object is initialized. Create 5 objects of the class Print its v each object.

Code :

```
public class Gadget implements Taxable {
    static int gadgetcount = 0;
    String gadgetName;
    int cost;

    {
        gadgetcount += 1;
    }

    Gadget() {

    }

    public Gadget(String gadgetName) {
        this.gadgetName = gadgetName;
    }

    void disp() {
        System.out.println("The object of a class Gadget is initialized " + gadgetcount + " time
    }
```

```
}
```

Main method :

```
   public static void main(String args[])
    {
        Gadget g=new Gadget();
        Gadget g1=new Gadget();
        Gadget g2=new Gadget();
        Gadget g3=new Gadget();
        Gadget g4=new Gadget();
        g.disp();
    }
}
```

Output :

Conclusion: Thus, we understood and executed various programs using classe explored various concepts related to these topics.

Practical no. 4

Aim:

4.1 Create a package com.gpm.complex. Create an interface Complex in it
methods: realPart(), imgPart(), magnitude() and argument() along with de
minus(), into() and divideBy() having appropriate parameters and return t

4.2 In the same package create class CartesianComplex with real and img
with r and theta as their member fields. Make the classes implement the
Override all non-default methods in the interface. Also override toString()

4.3 Now in main(), create one objects of both the classes defined in 4.2 an
multiplication.

4.4 Create a Java swing frame by creating a subclass of javax.swing.JFrame
java.awt.event.MouseListener by passing an object of an anonymous subc
java.awt.event.MouseAdapter on the JFrame. Display the coordinates of p
clicked

Tool used: Editor (Notepad/Intellij IDE), JDK and JRE

Theory:

Java Package

A **java package** is a group of similar types of classes, interfaces and sub-packages.

Package in java can be categorized in two form, built-in package and user-defined package.

There are many built-in packages such as java, lang, awt, javax, swing, net, io, util, sql etc.

Here, we will have the detailed learning of creating and using user-defined packages.

Advantage of Java Package

1) Java package is used to categorize the classes and interfaces so that they can be easily maintained.

2) Java package provides access protection.

3) Java package removes naming collision.

The -d switch specifies the destination where to put the generated class file. You can use any directory name (in case of windows) etc. If you want to keep the package within the same directory, you can use . (dot).

How to run java package program

You need to use fully qualified name e.g. mypack.Simple etc to run the class.

To Compile: javac -d . Simple.java

To Run: java mypack.Simple

Output:Welcome to package

The -d is a switch that tells the compiler where to put the class file i.e. it represents destination. The . repr folder.

How to access package from another package?

There are three ways to access the package from outside the package.

1. import package.*;
2. import package.classname;
3. fully qualified name.

1) Using packagename.*

If you use package.* then all the classes and interfaces of this package will be accessible but not subpackag

The import keyword is used to make the classes and interface of another package accessible to the current p

Example of package that import the packagename.*

```
//save by A.java
package pack;
public class A{
  public void msg(){System.out.println("Hello");}
}
```

```
//save by B.java
package mypack;
import pack.*;

class B{
```

```
//save by B.java
package mypack;
import pack.A;

class B{
  public static void main(String args[]){
   A obj = new A();
   obj.msg();
  }
}
```

Output:Hello

---

3) Using fully qualified name

If you use fully qualified name then only declared class of this package will be accessible. Now there is no
fully qualified name every time when you are accessing the class or interface.

It is generally used when two packages have same class name e.g. java.util and java.sql packages contain D

Example of package by import fully qualified name

```
//save by A.java
package pack;
public class A{
  public void msg(){System.out.println("Hello");}
}

//save by B.java

package mypack;
class B{
  public static void main(String args[]){
   pack.A obj = new pack.A();//using fully qualified name
   obj.msg();
  }
}
```

Output:Hello

If you import a package, all the classes and interface of that package will be imported excluding the classes
Hence, you need to import the subpackage as well.

Java JFrame

The javax.swing.JFrame class is a type of container which inherits the java.awt.Frame class. JFrame

```
        panel.add(button);
        frame.add(panel);
        frame.setSize(200, 300);
        frame.setLocationRelativeTo(null);
        frame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
        frame.setVisible(true);
    }
}
```

Code:

4.1 Create a package com.gpm.complex. Create an interface Complex in it v methods: realPart(), imgPart(), magnitude() and argument() along with def minus(), into() and divideBy() having appropriate parameters and return ty

Code :

```
package com.gpm.complex;

public interface Complex {
    void realPart();

    void imgPart();

    void magnitude();

    void argument();

    default float plus(float a, float b) {
        return a + b;
    }

    default float minus(float a, float b) {
        return a - b;
    }

    default float into(float a, float b) {
        return a * b;
    }

    default float divideBy(float a, float b) {
        return a / b;
    }

}
```

```
    @Override
    public void magnitude() {

    }

    @Override
    public void argument() {

    }

}
```

```
package com.gpm.complex;

public class PolarComplex implements Complex {
    PolarComplex r;
    PolarComplex theta;

    @Override
    public String toString() {
        return "PolarComplex";
    }

    @Override
    public void realPart() {

    }

    @Override
    public void imgPart() {

    }

    @Override
    public void magnitude() {

    }

    @Override
    public void argument() {

    }
}
```

Output :

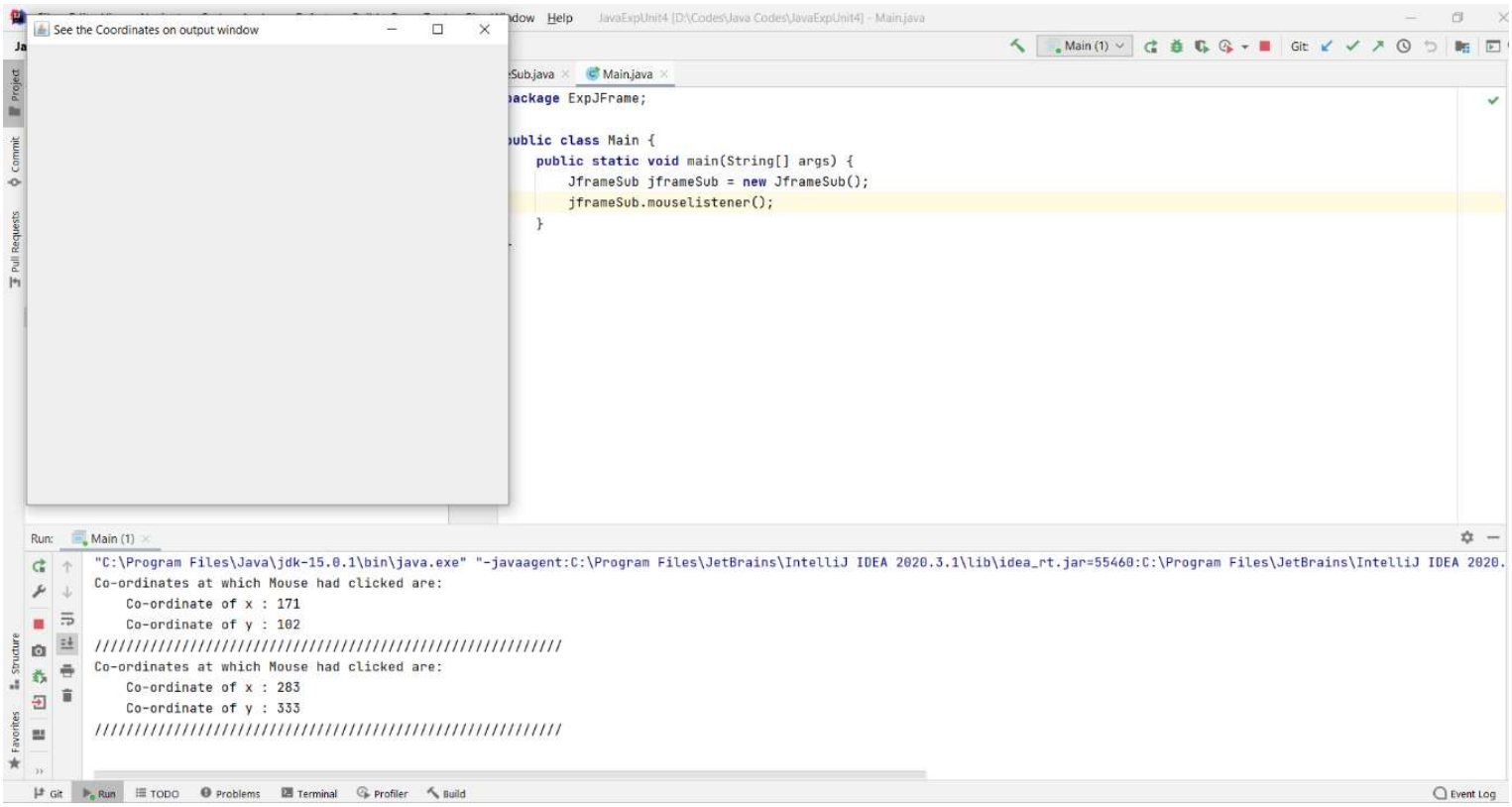
4.4 Create a Java swing frame by creating a subclass of javax.swing.JFram java.awt.event.MouseListener by passing an object of an anonymous subcla java.awt.event.MouseAdapter on the JFrame. Display the coordinates of po clicked.

Code :

```
package ExpJFrame;

import javax.swing.*;
import java.awt.event.MouseAdapter;
import java.awt.event.MouseEvent;

public class JframeSub extends JFrame {

    public JframeSub() {

    }

    public void mouselistener() {

        addMouseListener(new MouseAdapter() {
            public void mousePressed(MouseEvent e) {
                int x = e.getX();
                int y = e.getY();
                System.out.println("Co-ordinates at which Mouse had clicked are: \n" +
                        "\tCo-ordinate of x : " + x +
                        "\n\tCo-ordinate of y : " + y);
                System.out.println("////////////////////////////////////////////////////////////
            }
        });

        setTitle("See the Coordinates on output window");
        setLayout(null);
        setVisible(true);
        setSize(500, 500);
        setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);

    }
}
```

Main method :

```
package ExpJFrame;
```



Conclusion: Thus, we understood and executed programs regarding ir framework.

Practical no. 5

Aim: Using Stream API implement following programs.

- 5.1 Write a generic method to count the number of elements in a collection th (for example, odd integers, prime numbers, palindromes).
- 5.2 Write a method which takes a list of words as an argument, groups the wo returns the groupings in the form of Map>. (The keys in the map are the lengt of words of that length.)
- 5.3 Given a List<List> write a program to convert it into a List. (Hint: Use flatM interface)
- 5.4 Given: class Album{ public final String name; public final int yearOfRelease
  class Track{ public final int rating; }
  a) Write a method which takes a list of albums as an argument and returns a l sorted by the year of release.
  b) Write a method which takes a list of albums as an argument and returns a l containing at least one track having rating more than four. The returned list sh release.

Tool used: Editor (Notepad/Intellij IDE), JDK and JRE

Theory:

Stream In Java

Introduced in Java 8, the Stream API is used to process collections of objects. A s objects that supports various methods which can be pipelined to produce the desi The features of Java stream are –

- A stream is not a data structure instead it takes input from the Collections,
- Streams don't change the original data structure, they only provide the res methods.
- Each intermediate operation is lazily executed and returns a stream as a r intermediate operations can be pipelined. Terminal operations mark the en the result

3. **sorted:** The sorted method is used to sort the stream.

```
List names = Arrays.asList("Reflection","Collection","Stream");
List result = names.stream().sorted().collect(Collectors.toList());
```

Terminal Operations:

1. **collect:** The collect method is used to return the result of the intermediate the stream.

```
List number = Arrays.asList(2,3,4,5,3);
Set square = number.stream().map(x->x*x).collect(Collectors.toSet());
```

2. **forEach:** The forEach method is used to iterate through every element of

```
List number = Arrays.asList(2,3,4,5);
number.stream().map(x->x*x).forEach(y->System.out.println(y));
```

3. **reduce:** The reduce method is used to reduce the elements of a stream to The reduce method takes a BinaryOperator as a parameter.

```
List number = Arrays.asList(2,3,4,5);
int even = number.stream().filter(x->x%2==0).reduce(0,(ans,i)-> ans+i);
```

Here ans variable is assigned 0 as the initial value and i is added to it .

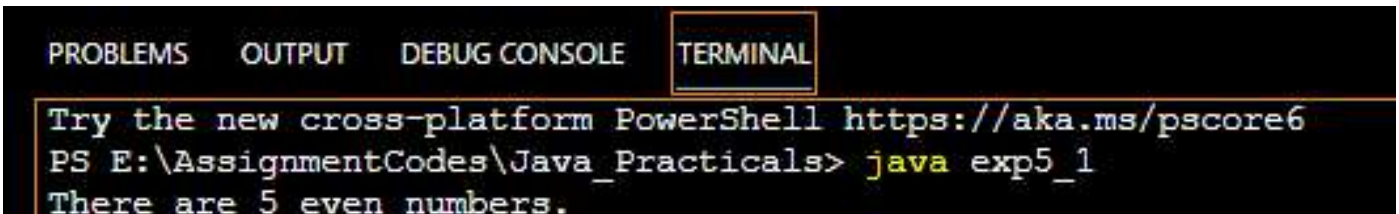
Code:

- **5.1 Write a generic method to count the number of elements in a collection that hav example, odd integers, prime numbers, palindromes).**

```
import java.util.Arrays;
import java.util.List;
import java.util.stream.Stream;


public class  exp5_1 {
```

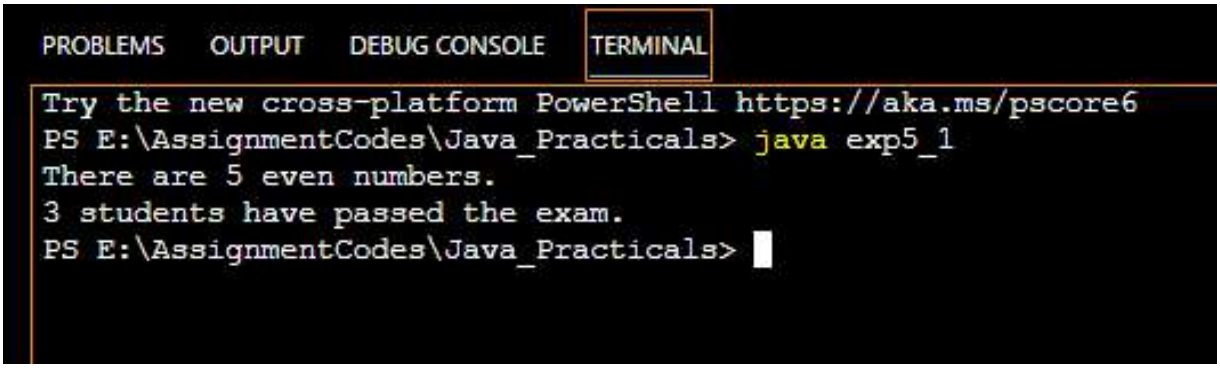
```
    }

    public static <T extends Student> long  numberOfPassedStudents(List<? extends Student> lis
        Stream<T> stream = (Stream<T>) list.stream();
        return stream.filter(student -> student.marks >= 35).count();

    }

    public static void main(String[] args) {

        Student s1 = new Student("Roy", 43, 60);
        Student s2 = new Student("Niel", 44, 49);
        Student s3 = new Student("Leo", 30, 75);
        Student s4 = new Student("lisa", 35, 30);
        Student s5 = new Student("Russ", 40, 28);

        List<Integer> list = Arrays.asList(1, 2, 3, 4, 5, 6, 7, 8, 9, 10);
        List<Student> list1 = Arrays.asList(s1, s2, s3, s4, s5);

        long evenNumbers = evenNumbers(list) ;
        long numberOfPassedStudents = numberOfPassedStudents(list1) ;

        System.out.println("There are "+ evenNumbers +" even numbers.");
        System.out.println(numberOfPassedStudents+" students have passed the exam.");
    }
}
```

Output:



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

        // create a list

    List<String> strings = Arrays.asList("this", "is", "a", "long", "list", "of",
            "strings", "to", "use", "as", "a", "trial");

    stream = strings.stream();
    Map<Integer, List<String>> lengthMap = stream.collect(Collectors.groupingBy(Strin

    lengthMap.forEach((k,v) -> System.out.printf("%d: %s%n", k, v));
    }
}
```

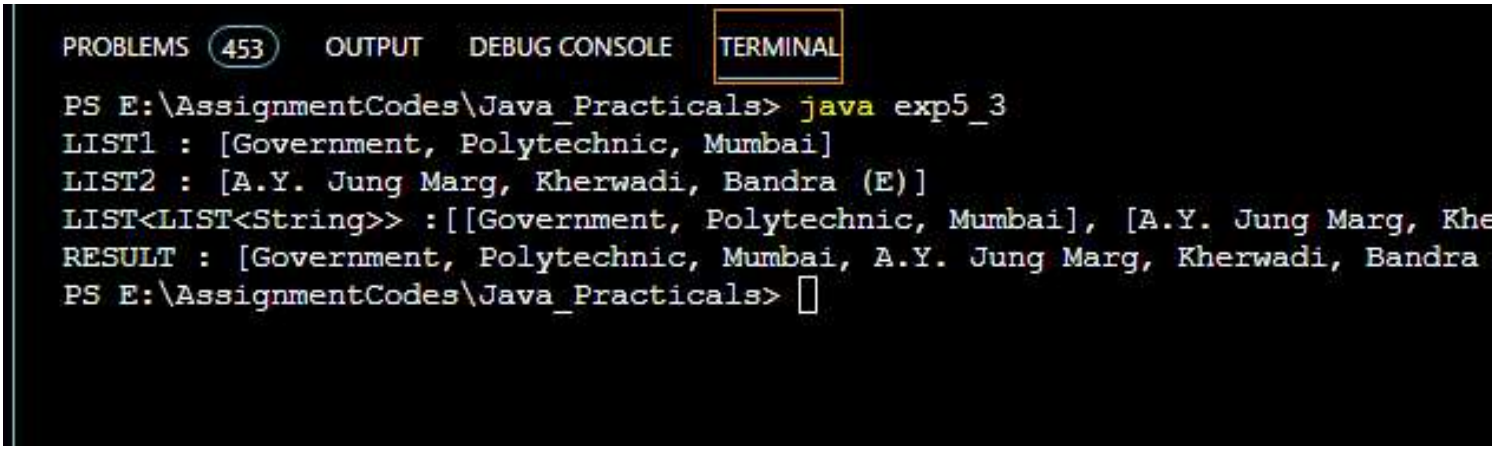
Output:



- **5.3 Given a List<List> write a program to convert it into a List. (Hint: Use fla interface)**

```
import java.util.*;

import java.util.stream.*;

class exp5_3 {

    public static void main(String[] args) {

        ArrayList<String> list1 = new ArrayList();
```

```
        System.out.println("LIST1 : " + list1);
        System.out.println("LIST2 : " + list2);
        System.out.println("LIST<LIST<String>> :" + listOflist);

        ArrayList<String> result = new ArrayList();
        listOflist.forEach(result::addAll);

        System.out.println("RESULT : " + result);
    }
}
```



- **5.4 Given: class Album{ public final String name; public final int yearOfRele tracks;**

  class Track{ public final int rating; }

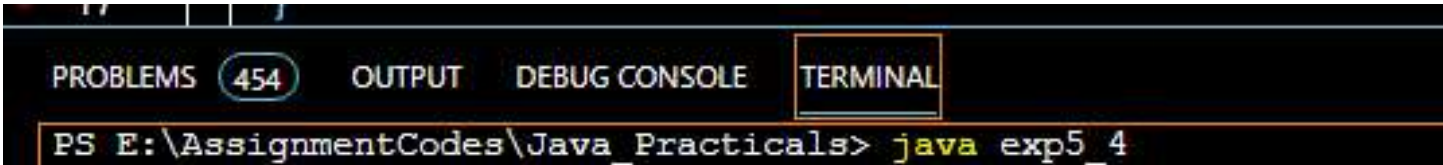
  a) Write a method which takes a list of albums as an argument and returns albums sorted by the year of release.

  b) Write a method which takes a list of albums as an argument and returns albums containing at least one track having rating more than four. The retu

```
    public String toString(){
        return this.name + " (" + this.rating + ") ";
    }
}
static class Album{
    public final String name;
    private final List<Track> tracks;
    private int yearOfRelease;
    public int getYear(){
        return yearOfRelease;
    }
    public List<Track> getTracks(){
        return tracks;
    }
    public int maxRating(){
        Track maxTrack = tracks.stream().reduce(new Track("temp",0), (ma
            if(maxTrackYet.rating < currTrack.rating)
                return currTrack;
            return maxTrackYet;
        });
        return maxTrack.rating;
    }
    public Album(String name, List<Track> trackList, int yearOfRelease){
        this.name = name;
```

```
    List<String> sortedList = new ArrayList<>();
    for(Object obj : sorted)
        sortedList.add(String.valueOf(obj));
    return sortedList;
}

static public List<String> filterGoodAlbums(List<Album> albums){
    List<String> goodAlbums = new ArrayList<>();
    albums.stream().forEach(album -> {
        if(album.maxRating() >4)
            goodAlbums.add(album.toString());
    });
     return goodAlbums;
}

public  static void main(String[] args) {
    System.out.println();
    // Preparing albums and tracks
    String[] travelNames = {"Ve maahi", "Duniya", "Bolna", "Kabira", "Vaa
    int[] travelRatings= {5,6,4,8,5};
    List<Track> travelSongs = new  ArrayList<>();
    for(int i=0; i<travelNames.length; i++)
        travelSongs.add(new Track(travelNames[i], travelRatings[i]));
    Album travelAlbum = new Album("Travel",travelSongs, 2009);
```

```
        for(int i=0; i<hipHopNames.length; i++)
            hipHopSongs.add(new Track(hipHopNames[i], hiphopRatings[i]));
        Album hipHopAlbum = new Album("Hip hop",hipHopSongs, 2017);


        String[] jazzNames = {"Sham", "Masakali","Lovely"};
        int[] jazzRatings = {3,1,2};
        List<Track> jazzSongs = new  ArrayList<>();
        for(int i=0; i<jazzNames.length; i++)
           jazzSongs.add(new Track(jazzNames[i], jazzRatings[i]));
        Album jazzAlbum = new Album("Jazz",jazzSongs, 1995);


        List<String> sortedAlbums =  sortAlbumsByYear(Arrays.asList(travelAl
hipHopAlbum, rapAlbum));
        System.out.println("Sorted list of albums by their year of release: \n"+


        List<String> goodAlbums =  filterGoodAlbums(Arrays.asList(travelAlbu
hipHopAlbum, rapAlbum));
        System.out.println("Sorted list of Good albums(rating>4) by their yea
\n"+goodAlbums);


    }
}
```



Practical no. 6

Aim: Implement programs related to File I/O

- 6.1 Create a csv file which will contain 10 integers in a spreadsheet. Read the file and display the sum of the numbers in the file. Handle all possible exceptions. W read and modify a file.
- 6.2 Create two objects of class Path viz., source and target. Perform the followin source b. Copy a file from source to target c. Move a file from source to target d. Retrieve information about source and target

Tools used: Editor (Notepad/Intellij IDE), JDK and JRE

Theory:

Java file I/O

Java I/O (Input and Output) is used *to process the input* and *produce the output*.

Java uses the concept of a stream to make I/O operation fast. The java.io package contains all the classes required fo

We can perform **file handling in Java** by Java I/O API.

The two important streams are **FileInputStream** and **FileOutputStream**

FileInputStream

This stream is used for reading data from the files. Objects can be created using the keyw types of constructors available.

Following constructor takes a file name as a string to create an input stream object to read th

```
InputStream f = new FileInputStream("C:/java/hello");
```

Following constructor takes a file object to create an input stream object to read the file. Fir File() method as follows −

```
File f = new File("C:/java/hello");
InputStream f = new FileInputStream(f);
```

Once you have *InputStream* object in hand, then there is a list of helper methods which can do other operations on the stream.

Directories in Java

A directory is a File which can contain a list of other files and directories. Yo
directories, to list down files available in a directory. For complete detail, check a l
you can call on File object and what are related to directories.

Creating Directories

There are two useful **File** utility methods, which can be used to create directories

- The **mkdir( )** method creates a directory, returning true on success and false
  that the path specified in the File object already exists, or that the directory
  the entire path does not exist yet.
- The **mkdirs()** method creates both a directory and all the parents of the direc

Code:

- **Create a csv file which will contain 10 integers in a spreadsheet. Read the f
  java.util.Scanner and display the sum of the numbers in the file. Handle all
  Write a Java program to create, read and modify a file.**

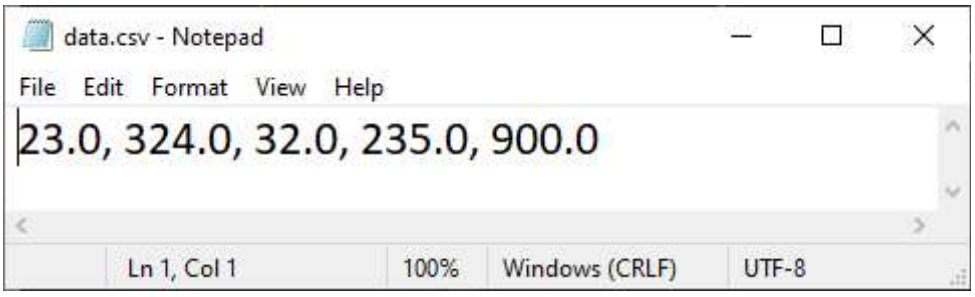
```
import java.util.*;
import java.io.*;


public class exp6_1 {
    public static void main(String[] args) {
        double sum = 0;
        List<Double> numbers = new ArrayList<>();


        String dataFilePath = "data.csv";
        String defaultData = "200,500,25,50\n100,50,25\n70,30,40,60\n40\n60,90,150
        Scanner inputScanner = new Scanner(System.in);
        char opted;
```

```
            defauFileWriter.close();
        } else
            System.out.println("There was a problem creating new file, try creating

    } catch (Exception e) {
        System.out.println("An error occurred while writing default data to the file
        e.printStackTrace();
    }
}

// Find sum of all numbers in csv file
// All numbers in CSV file:

displaySum(dataFile, sum, numbers);

// Modify the numbers in csv file

System.out.print("Do you want to write numbers to csv file? y/n: ");
opted = inputScanner.nextLine().trim().charAt(0);
if (opted == 'y' || opted == 'Y') {
    int n;
    double entity;
    System.out.println("How many decimal numbers do you wish to write to file
    n = inputScanner.nextInt();
    System.out.println("Enter the numbers separated by spaces:");
    List<Double> newData = new ArrayList<>();
```

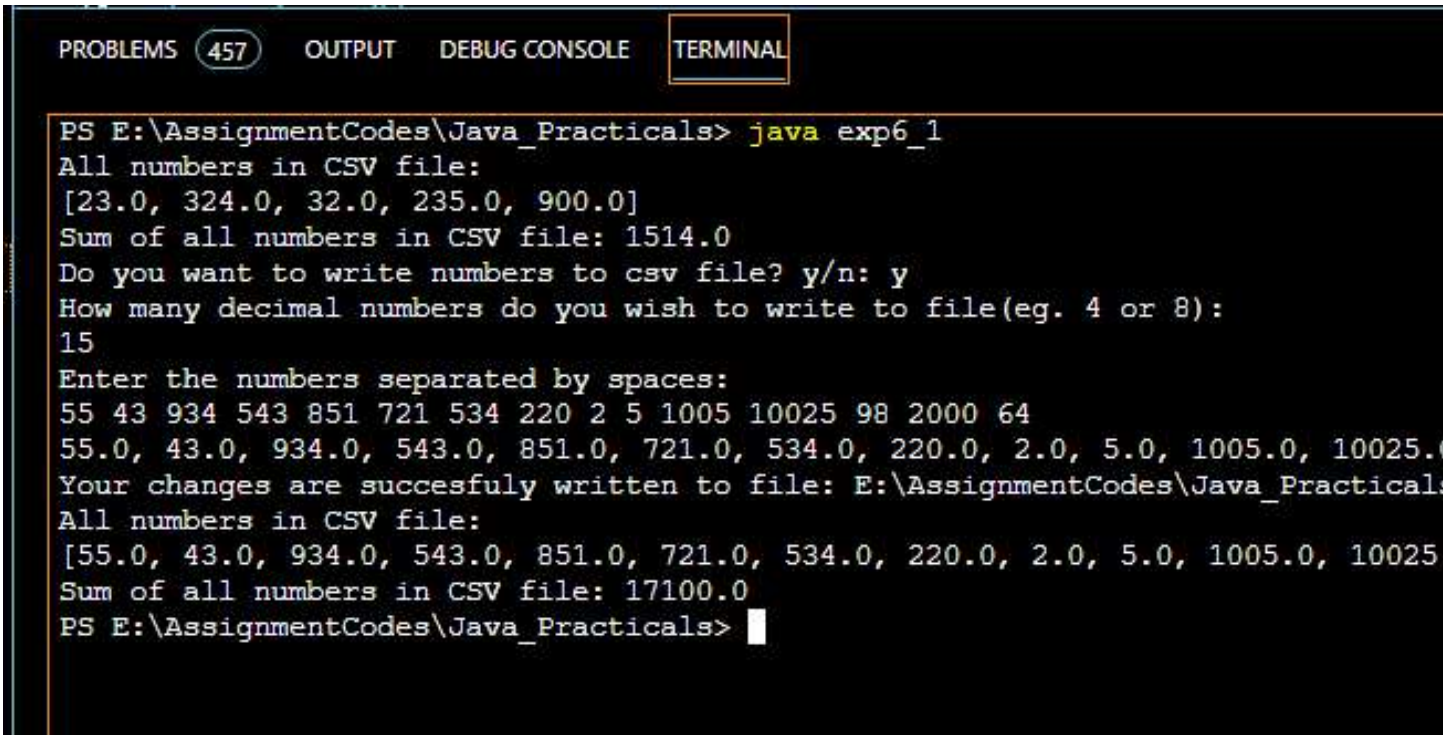
```
            System.out.println("Your changes are succesfuly written to file: " + dataFil
        } catch (Exception e) {
            System.out.println("xxxxxx ERROR xxxxxxxxx::: Close the CSV file And Try A
            e.printStackTrace();
        }
    }
    numbers.clear();
    sum = 0;
    displaySum(dataFile, sum, numbers);                    // All numbers in CSV file:
    inputScanner.close();
}

private static void displaySum(File dataFile, double sum, List<Double> numbers) {
    try {
        Scanner csvScanner = new Scanner(dataFile);
        Scanner dataScanner = null;
        while (csvScanner.hasNextLine()) {
            dataScanner = new Scanner(csvScanner.nextLine());
            dataScanner.useDelimiter(",");

            while (dataScanner.hasNext()) {
                try {
                    String data = dataScanner.next().trim();
                    numbers.add(Double.parseDouble(data));
                    sum += Double.parseDouble(data);
                } catch (NumberFormatException ne) {
```

```
        System.out.println("Sum of all numbers in CSV file: " + sum);
    }
}
```

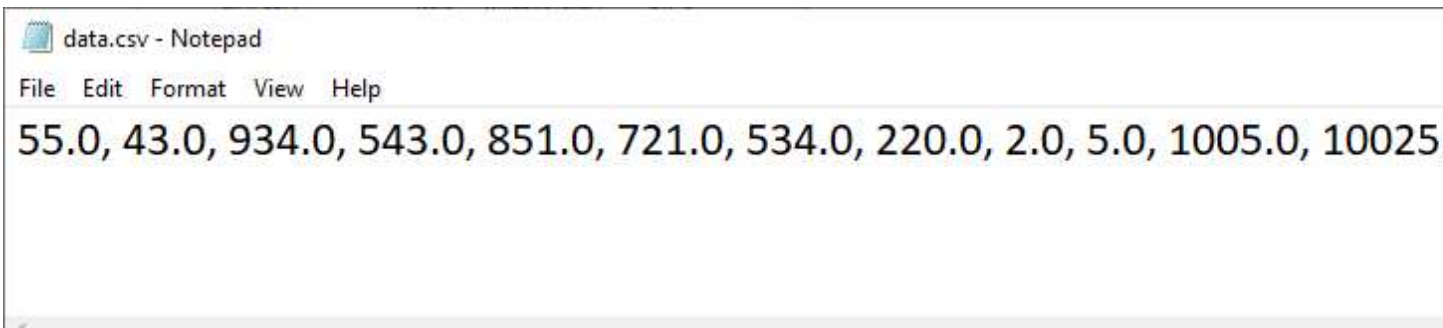
Previous CSV file:



Output:



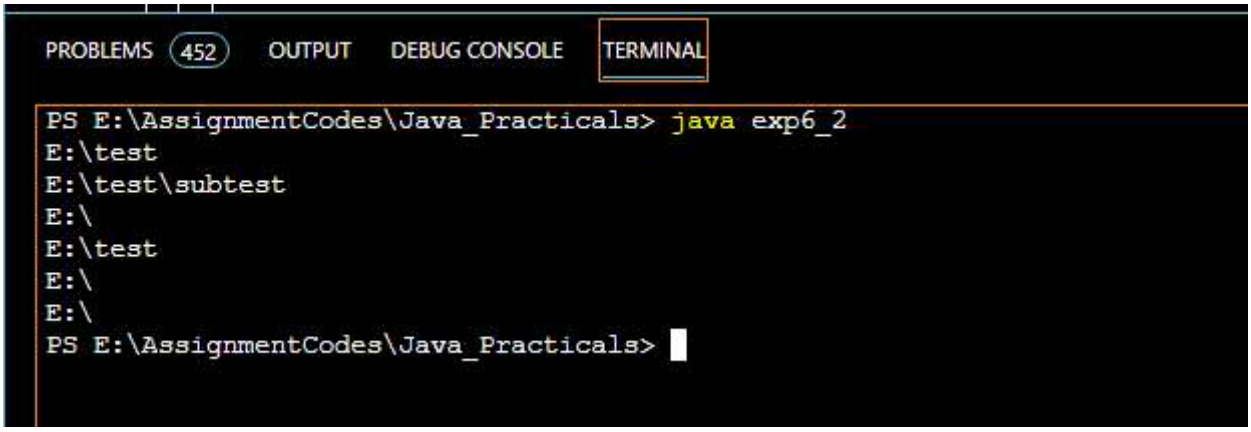
CSV file after modifications:

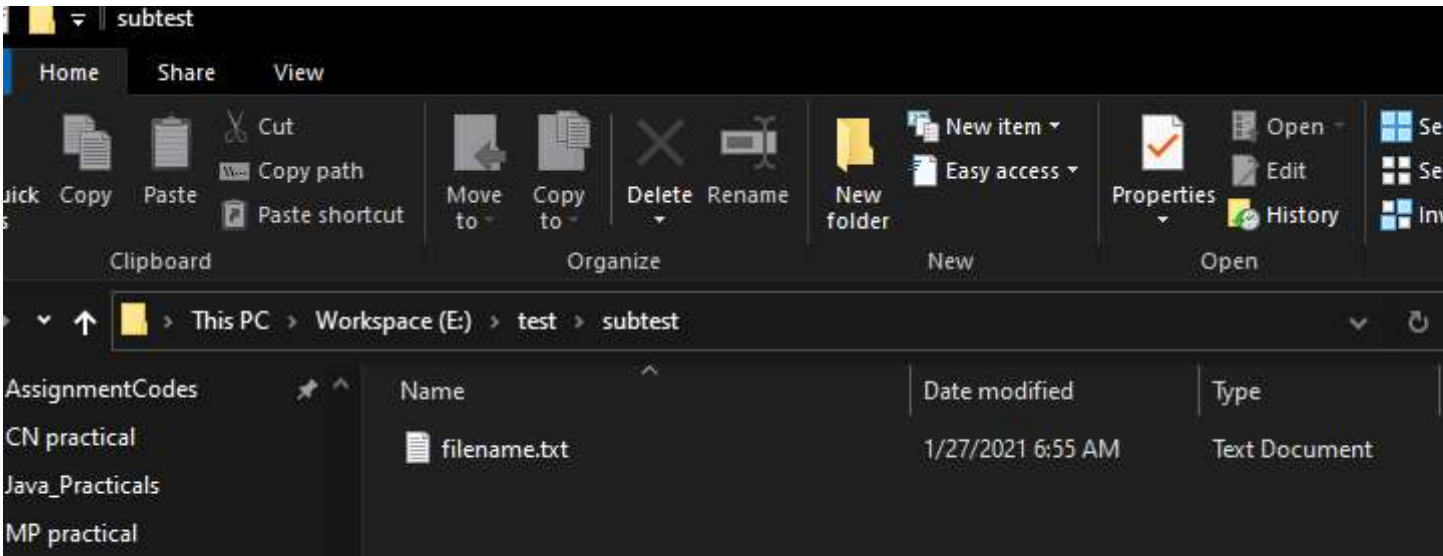


```
try{
   Path source = Paths.get("E:\\test");
   Path target = Paths.get("E:\\test\\subtest");

   String fn1=source+"\\";
   String fn2=target+"\\";

   FileWriter myWriter = new FileWriter(fn1+"filename.txt");
   myWriter.write("Files in Java might be tricky, but it is fun enough!")
   myWriter.close();


   //copy
   InputStream is = null;
   OutputStream os = null;
   File s=new File(fn1+"filename.txt");
   File d=new File(fn2+"filename.txt");
   is = new FileInputStream(s);
   os = new FileOutputStream(d);
   byte[] buffer = new byte[1024];
   int length;
   while ((length = is.read(buffer)) > 0) {
      os.write(buffer, 0, length);
   }
```

```
            System.out.println(source+"");
            System.out.println(target+"");
            System.out.println(source.getParent()+"");
            System.out.println(target.getParent()+"");
            System.out.println(source.getRoot()+"");
            System.out.println(target.getRoot()+"");
        }catch(Exception ex){
            System.out.println(ex+"");
        }
    }
}
```

Output:





Practical no. 7

Aim: Generate complete Javadocs for any two of the above experiments

Tool used: Editor (Notepad/Intellij IDE), JDK and JRE

Theory:

Javadoc

Javadoc is a tool which comes with JDK and it is used for generating Java code documenta
source code, which requires documentation in a predefined format.

Following is a simple example where the lines inside /*….*/ are Java multi-line comments. Si
// is Java single-line comment.

Example

```
/**

* The HelloWorld program implements an application that

* simply displays "Hello World!" to the standard output.

*

* @author  Omkar Phansopkar

* @version 1.0

* @since   2014-03-31

*/

public class HelloWorld {

   public static void main(String[] args) {

      // Prints Hello, World! on standard output.

      System.out.println("Hello World!");

   }

}
```

You can include required HTML tags inside the description part. For instance, the following example makes u
<p> has been used for creating paragraph break −

```
*/
public class HelloWorld {


   public static void main(String[] args) {
      // Prints Hello, World! on standard output.
      System.out.println("Hello World!");
   }
}
```

The javadoc Tags

The javadoc tool recognizes the following tags −

Tag	Description	Syntax
@author	Adds the author of a class.	@author name-text
{@code}	Displays text in code font without interpreting the text as HTML markup or nested javadoc tags.	{@code text}
{@docRoot}	Represents the relative path to the generated document's root directory from any generated page.	{@docRoot}
@deprecated	Adds a comment indicating that this API should no longer be used.	@deprecated deprecatedtext
@exception	Adds a **Throws** subheading to the generated documentation, with the classname and description text.	@exception class-name description

	the "Parameters" section.	
@return	Adds a "Returns" section with the description text.	@return description
@see	Adds a "See Also" heading with a link or text entry that points to reference.	@see reference
@serial	Used in the doc comment for a default serializable field.	@serial field-description | include | exclude
@serialData	Documents the data written by the writeObject( ) or writeExternal( ) methods.	@serialData data-description
@serialField	Documents an ObjectStreamField component.	@serialField field-name field-type field-description
@since	Adds a "Since" heading with the specified since-text to the generated documentation.	@since release
@throws	The @throws and @exception tags are synonyms.	@throws class-name description
{@value}	When {@value} is used in the doc comment of a static field, it displays the value of that constant.	{@value package.class#field}
@version	Adds a "Version" subheading with the specified version-text to the generated docs when the -version option is used.	@version version-text

```
public class exp7a{
   /**
    * in this method we are taking the numbers as input and returning the addti
    * @param x;
    * @return to main;
    */
   public static int add(int ...x)
   {
      return x[0]*x[0]+x[1]*x[1];
   }
   /**
    * this is the main method where the calling to add function is done and print
    * @param args
    */
   public static void main(String args[])
   {  //creating Scanner class object and passing system.in ;
      Scanner sc= new Scanner(System.in);
      System.out.println("enter the first number:");
      int n1=sc.nextInt();
      System.out.println("enter the second number:");
      int n2=sc.nextInt();
      int a=exp7a.add(n1,n2);
      System.out.print("the addtion of square root of indivisual is :"+a);
   }
```

```
    *@param args
    */
   public static void main(String args[])
   {
       System.out.println("sorting the array.....");
       System.out.println("sorted array:");
       Arrays.sort(args);
       for(String i:args)
       {
          System.out.println(i);
       }
   }
}
```

Generating docs:
Perform following commands to generate doc:
javadoc -d .\pathToDestination .\pathToSrc.java file.

Actual commands:

javadoc -d .\javadocs\ .\exp7a.java

javadoc -d .\javadocs\ .\exp7b.java

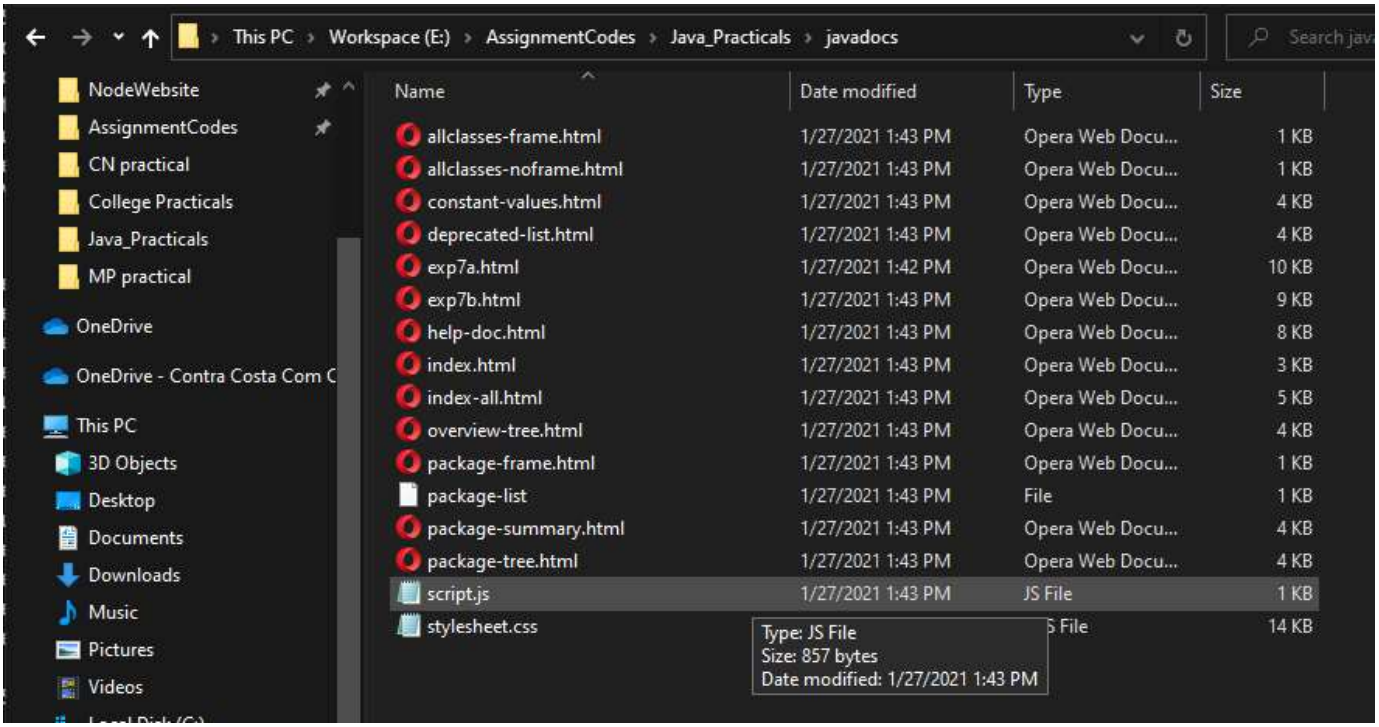
Windows PowerShell

```
PS E:\AssignmentCodes\Java_Practicals> javadoc -d .\javadocs\ .\exp7a.java
Loading source file .\exp7a.java...
Constructing Javadoc information...
Standard Doclet version 1.8.0_251
Building tree for all the packages and classes...
Generating .\javadocs\exp7a.html...
.\exp7a.java:17: warning: no description for @param
     * @param args
       ^
Generating .\javadocs\package-frame.html...
Generating .\javadocs\package-summary.html...
Generating .\javadocs\package-tree.html...
Generating .\javadocs\constant-values.html...
Building index for all the packages and classes...
Generating .\javadocs\overview-tree.html...
Generating .\javadocs\index-all.html...
Generating .\javadocs\deprecated-list.html...
Building index for all classes...
Generating .\javadocs\allclasses-frame.html...
Generating .\javadocs\allclasses-noframe.html...
Generating .\javadocs\index.html...
Generating .\javadocs\help-doc.html...
1 warning
PS E:\AssignmentCodes\Java_Practicals>
```

Windows PowerShell

```
PS E:\AssignmentCodes\Java_Practicals> javadoc -d .\javadocs\ .\exp7b.java
Loading source file .\exp7b.java...
Constructing Javadoc information...
Standard Doclet version 1.8.0_251
Building tree for all the packages and classes...
Generating .\javadocs\exp7b.html...
.\exp7b.java:8: warning: no description for @param
    *@param args
     ^
Generating .\javadocs\package-frame.html...
Generating .\javadocs\package-summary.html...
Generating .\javadocs\package-tree.html...
Generating .\javadocs\constant-values.html...
Building index for all the packages and classes...
Generating .\javadocs\overview-tree.html...
Generating .\javadocs\index-all.html...
Generating .\javadocs\deprecated-list.html...
Building index for all classes...
Generating .\javadocs\allclasses-frame.html...
Generating .\javadocs\allclasses-noframe.html...
Generating .\javadocs\index.html...
```

Docs Output:


This PC › Workspace (E:) › AssignmentCodes › Java_Practicals › javadocs
Search java
NodeWebsite
AssignmentCodes
CN practical
College Practicals
Java_Practicals
MP practical
OneDrive
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allclasses-noframe.html 1/27/2021 1:43 PM Opera Web Docu... 1 KB
constant-values.html 1/27/2021 1:43 PM Opera Web Docu... 4 KB
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exp7a.html 1/27/2021 1:42 PM Opera Web Docu... 10 KB
exp7b.html 1/27/2021 1:43 PM Opera Web Docu... 9 KB
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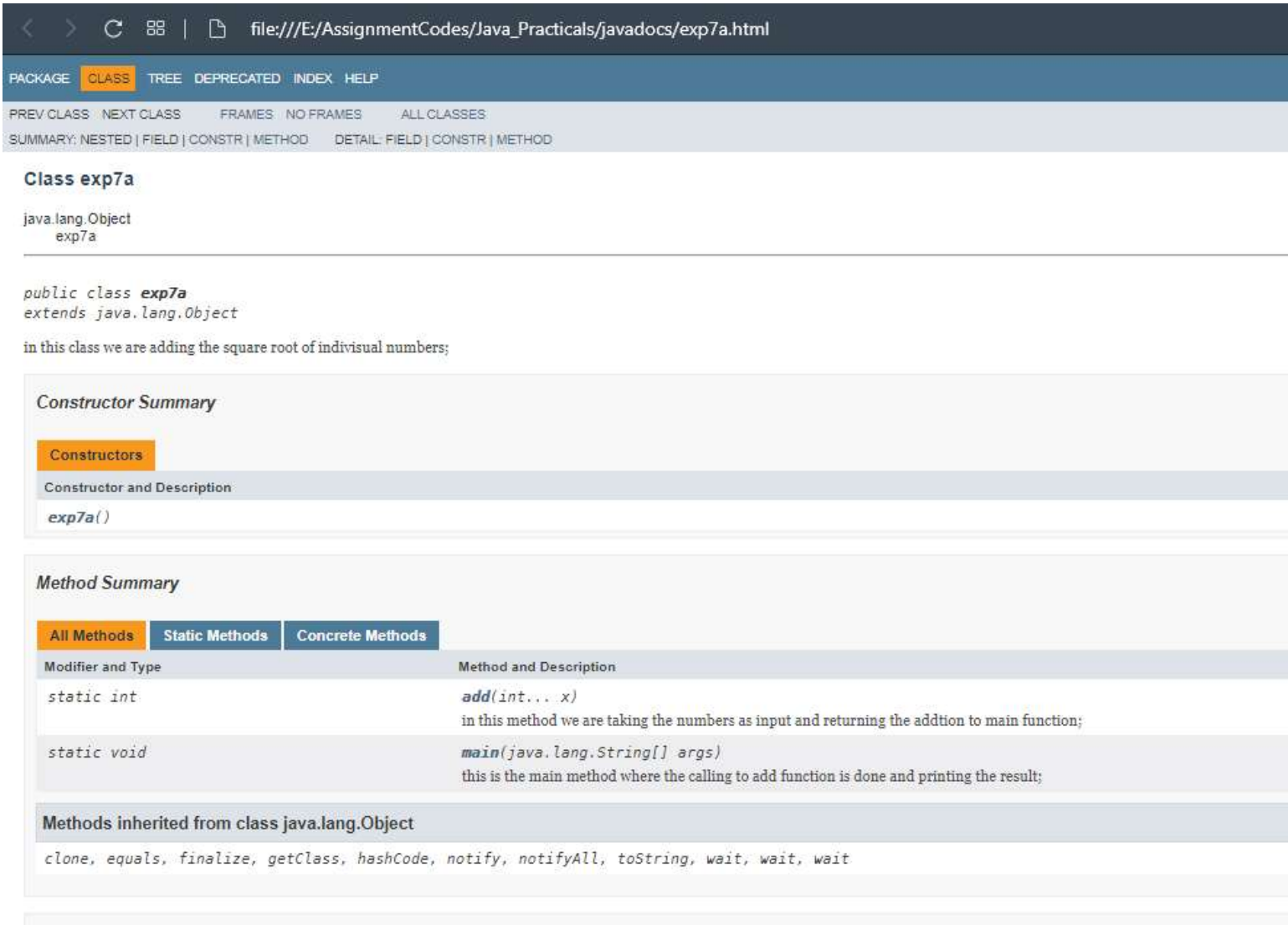
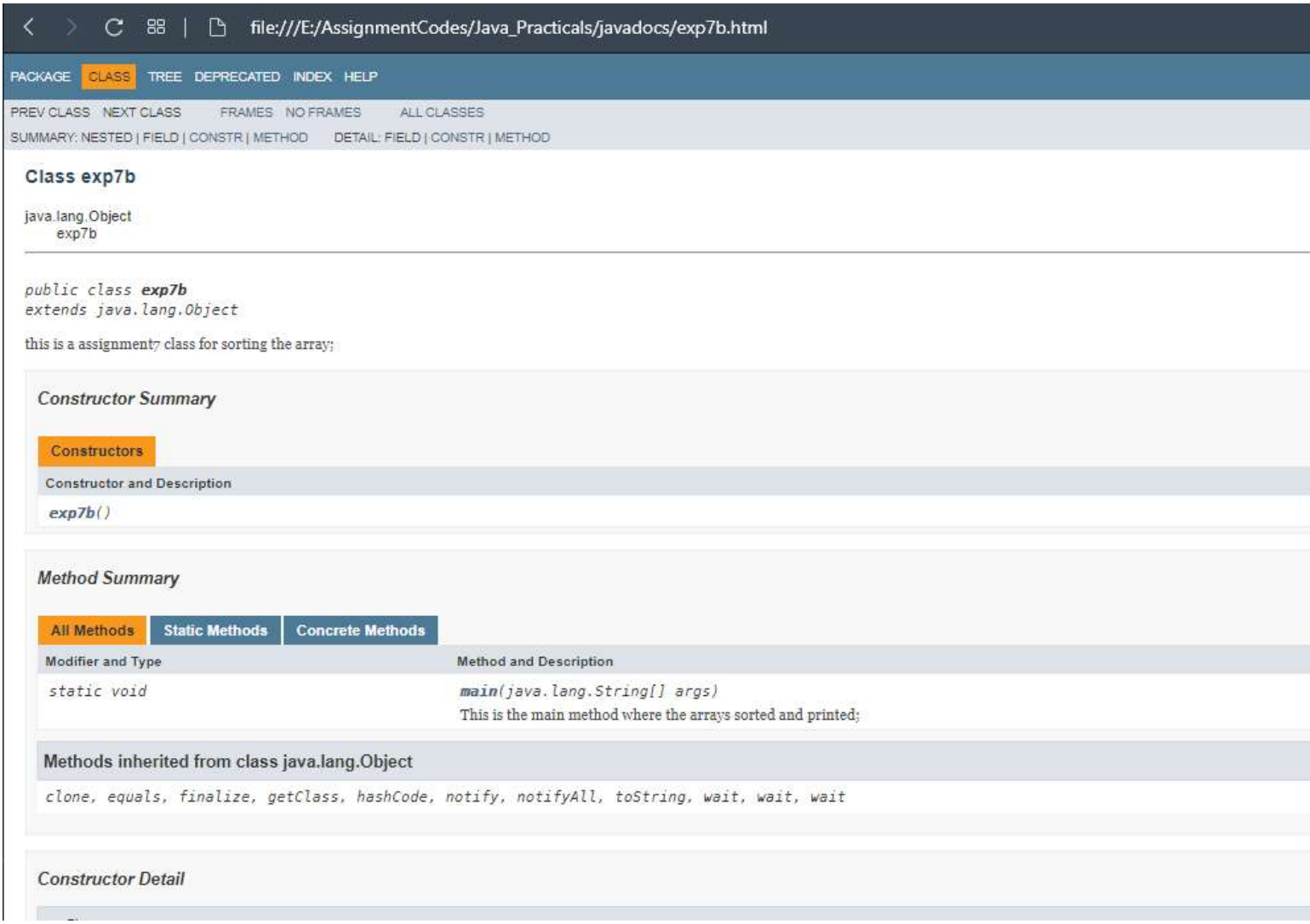
package-summary.html 1/27/2021 1:43 PM Opera Web Docu... 4 KB
package-tree.html 1/27/2021 1:43 PM Opera Web Docu... 4 KB
script.js 1/27/2021 1:43 PM JS File 1 KB
stylesheet.css 14 KB
Type: JS File
Size: 857 bytes
Date modified: 1/27/2021 1:43 PM


file:///E:/AssignmentCodes/Java_Practicals/javadocs/exp7a.html
PACKAGE CLASS TREE DEPRECATED INDEX HELP
PREV CLASS NEXT CLASS FRAMES NO FRAMES ALL CLASSES
SUMMARY: NESTED | FIELD | CONSTR | METHOD DETAIL: FIELD | CONSTR | METHOD
Class exp7a
java.lang.Object
exp7a
public class exp7a
extends java.lang.Object
in this class we are adding the square root of indivisual numbers;
Constructor Summary
Constructors
Constructor and Description
exp7a()
Method Summary
All Methods Static Methods Concrete Methods
Modifier and Type
Method and Description
static int
add(int... x)
in this method we are taking the numbers as input and returning the addtion to main function;
static void
main(java.lang.String[] args)
this is the main method where the calling to add function is done and printing the result;
Methods inherited from class java.lang.Object
clone, equals, finalize, getClass, hashCode, notify, notifyAll, toString, wait, wait, wait



Conclusion: Thus we understood and successfully created javadocs fo
various techniques used for commenting and documenting java exper

Java practicals

FS19CO042

Omkar Phansopkar

FS19CO042 SECOND YEAR, FIRST SHIFT

Practical no. 1

Aim:

Getting started with Java Application Development using IDE

1.1 Check whether latest version of java (at least JDK 1.8)is installed or no
and install it.

1.2 Download and install the IntelliJ IDEA Community Edition/ NetBeans ID
later version of IDE

1.3 Create a Java Project/ Application in the IDE

1.4 Create a Java class Person containing two variables name and yearOfB
types, take inputs from the command line argument, a method to display
person.

1.5 Save the project and run it.

1.6 Explore all the features (the menu and shortcuts) of the IDE. Learn abo

Tool used: Editor (Notepad/Intellij IDE), JDK and JRE

Theory:

Java

Java is a programming language created by James Gosling from Sun Microsystem
target of Java is to write a program once and then run this program on multiple op
publicly available version of Java (Java 1.0) was released in 1995. Sun Microsyste
Oracle Corporation in 2010. Oracle has now the steermanship for Java. In 2006 S
available under the GNU General Public License (GPL). Oracle continues this proj

Java virtual machine (JVM)

The Java virtual machine (JVM) is a software implementation of a computer that e
real machine.
The Java virtual machine is written specifically for a specific operating system, e.g

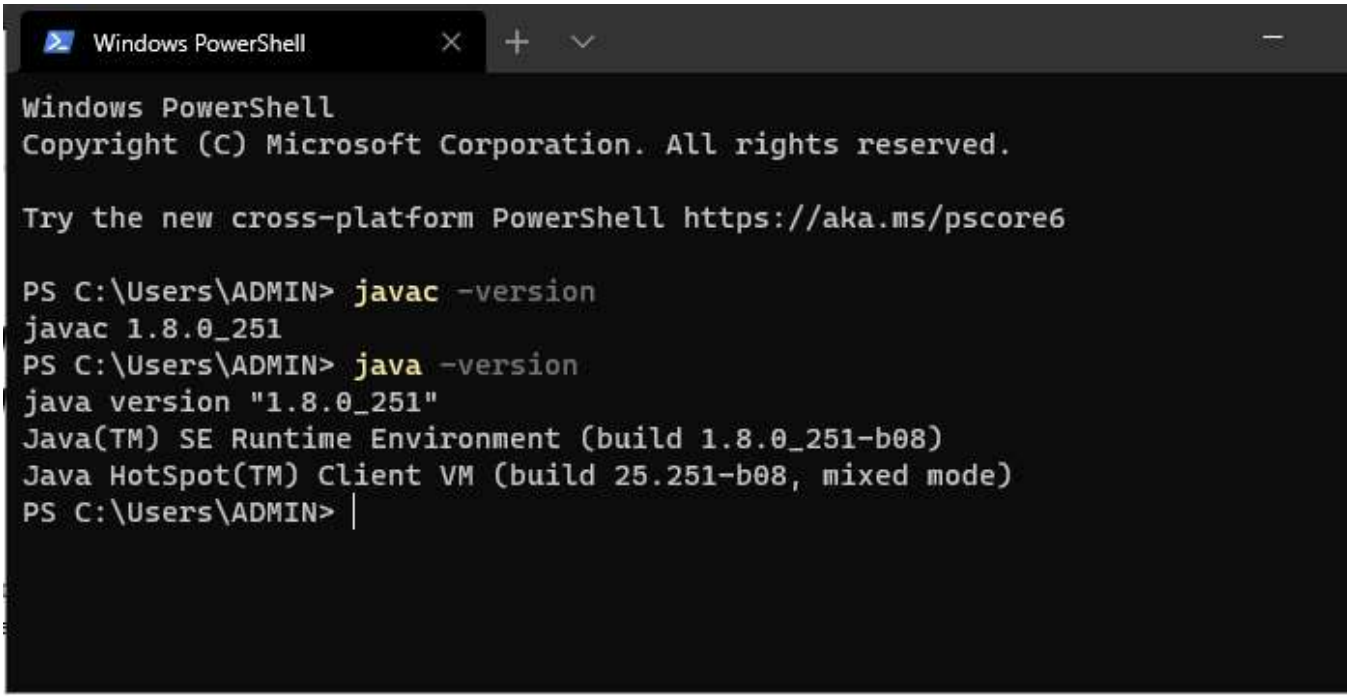
implementation is required as well as for Windows.

```
    }
}
```

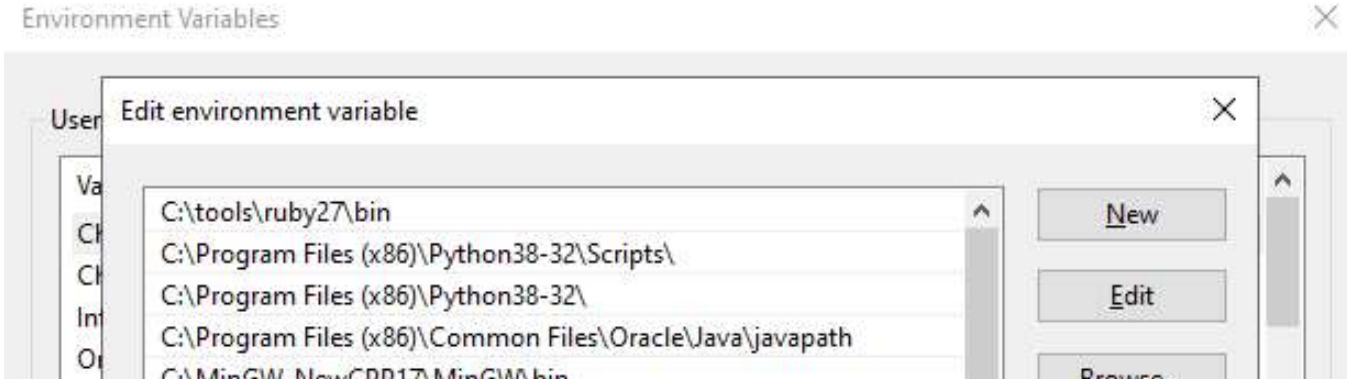
Steps:

1.1 Check whether latest version of Java (at least JDK 1.8) is installed or no and install it.

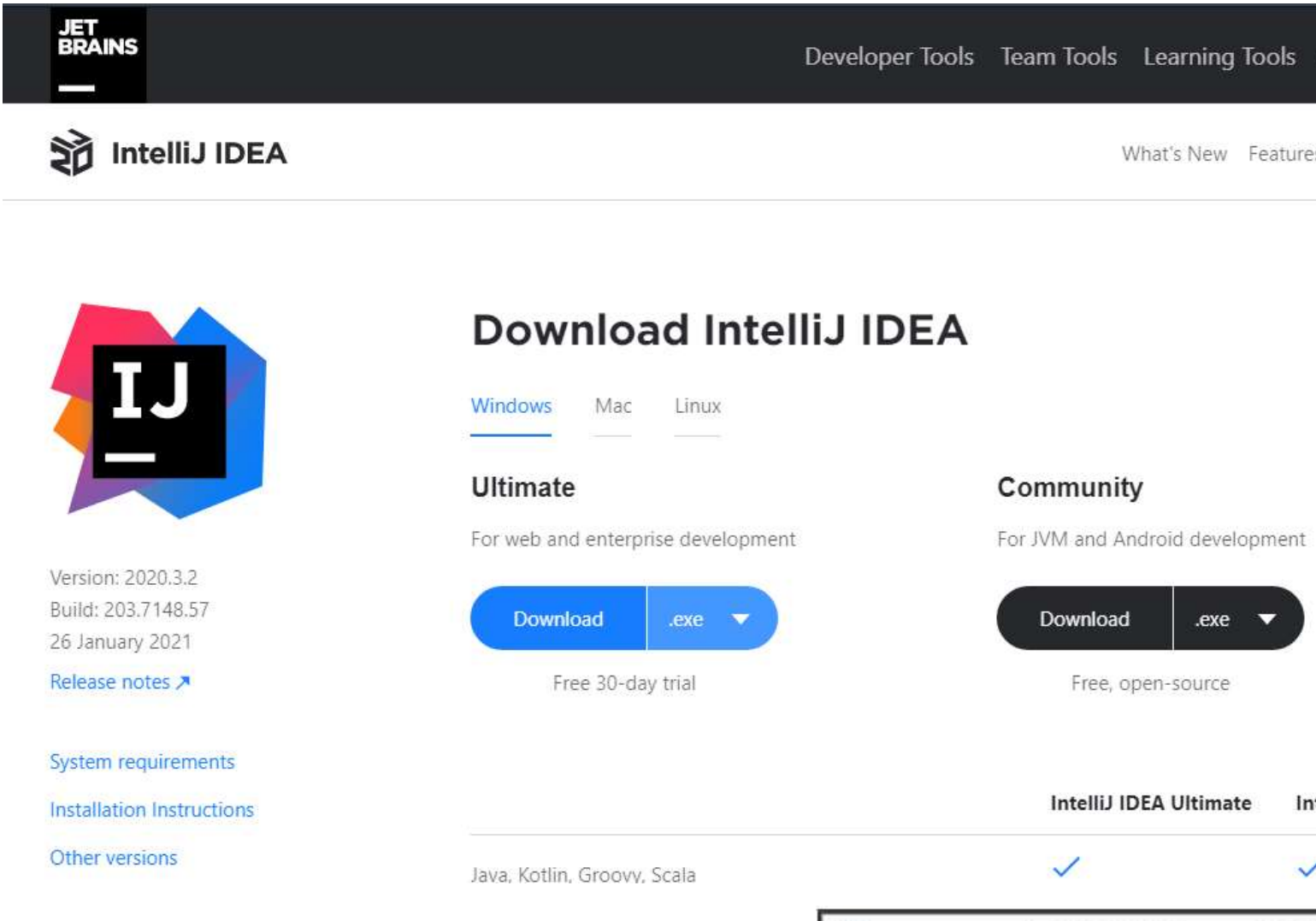
- Check if java compiler(javac) and jvm (java) are installed properly on
  Type these commands:
  javac -version
  java -version

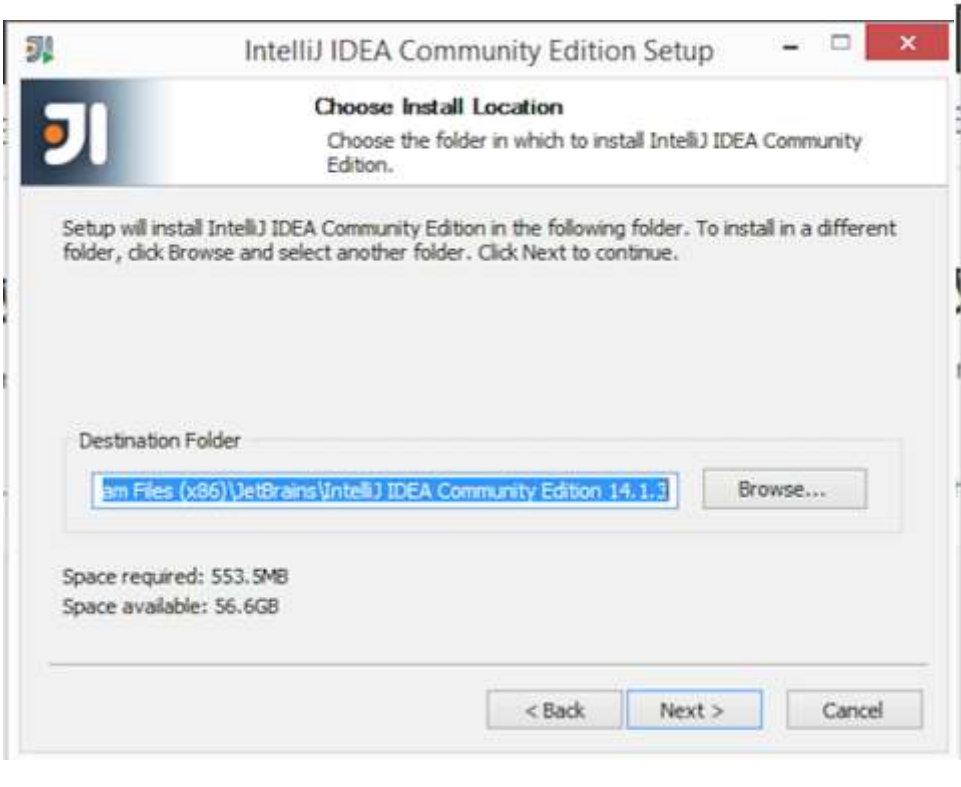


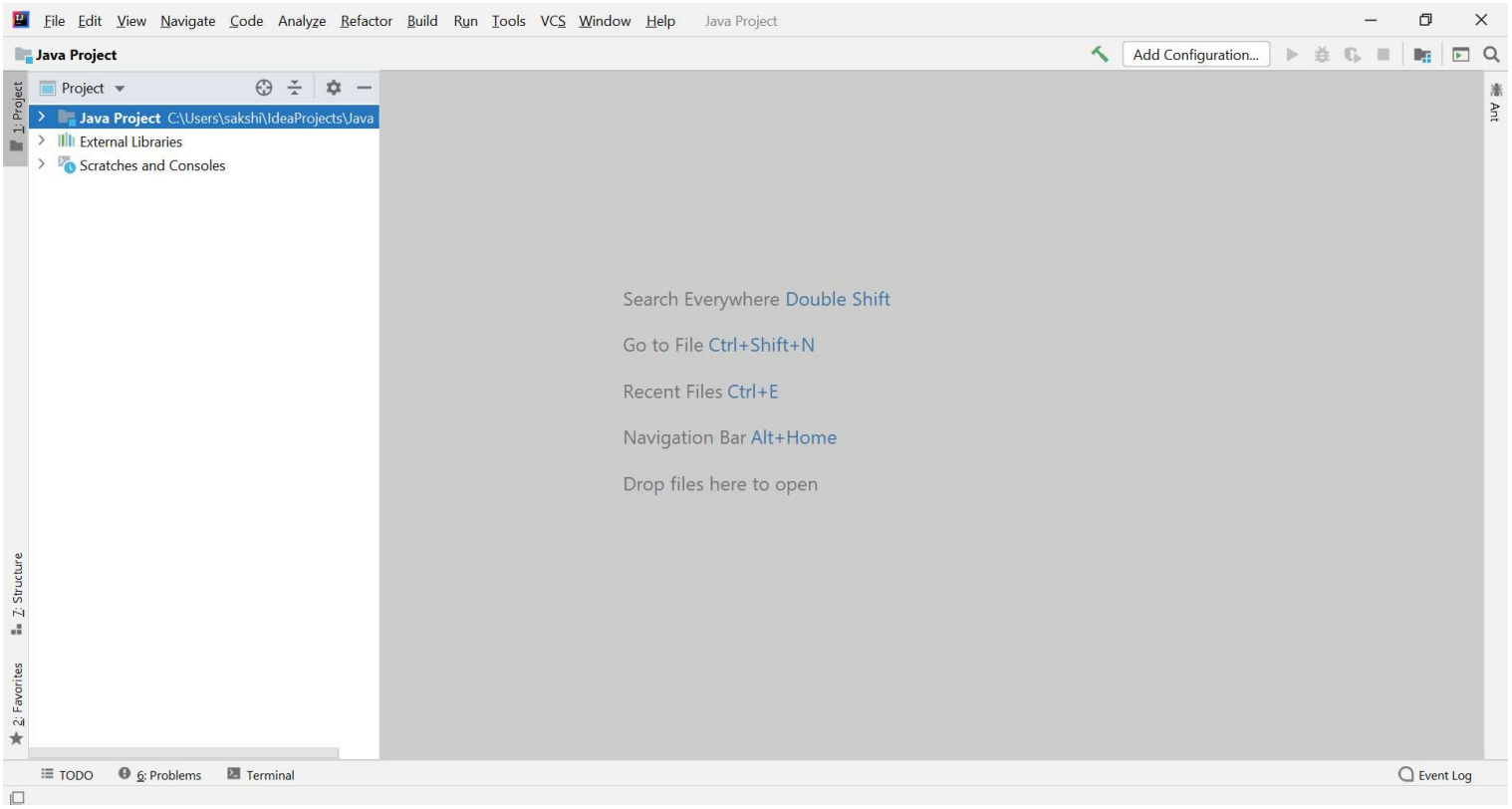
- If java compiler or jvm is not installed on system, download executibl
  execute to install JDK.
- Set environment variables to path where java is installed.



1.2 Download and install the IntelliJ IDEA Community Edition/ NetBeans later version of IDE







1.4 Create a Java class Person containing two variables name and yearOfB types, take inputs from the command line argument, a method to display th person.

```
public class Person
{
   String name;
   int yearOfBirth;

   public static void disp_details(String a,int b)
   {
     int current_year=2021;
     int age=current_year-b;
     System.out.println("name is "+a+" and age is "+age);

   }


   public static void main(String [] args )
   {
      disp_details("sakshi",2004);
```

	Find anything related to IntelliJ IDEA or your project and jump to it.
Ctrl+Shift+A	Find Action Find a command and execute it, open a tool window or s
Alt+Enter	Show intention actions and quick-fixes Fix highlighted error or warning, improve or optimize a c
F2 Shift+F2	Navigate between code issues Jump to the next or previous highlighted error.
Ctrl+E	View recent files Select a recently opened file from the list.
Ctrl+Shift+Enter	Complete current statement Insert any necessary trailing symbols and put the caret w typing the next statement.
Ctrl+Alt+L	Reformat code Reformat the whole file or the selected fragment accord code style settings.
Ctrl+Alt+Shift+T	Invoke refactoring Refactor the element under the caret, for example, safe rename, and so on.
Ctrl+W Ctrl+Shift+W	Extend or shrink selection Increase or decrease the scope of selection according to constructs.
Ctrl+/ Ctrl+Shift+/	Add/remove line or block comment Comment out a line or block of code.
Ctrl+B	Go to declaration Navigate to the initial declaration of the instantiated clas field.
Alt+F7	Find usages Show all places where a code element is used across you
Alt+1	Focus the Project tool window

Practical no. 2

Aim: Perform following programs.

2.1 Write a program to print “Hello World”.

2.2 Write a program to print addition of two integers.

2.3 Write a program to convert a numeric string into int.

2.4 Write a program to print addition of two integers input from comma

2.5 Write a program to take two integers from command line, subtract
the greater and print the result.

2.6 Write a program to take n integers from command line and print th
(product of first number and last number added to product of second n
number and so on).

2.7 Consider any two integers. Write a program to print sum of their sq

2.8 Write a program to find square root of a given positive integer using
square root.

2.9 Write a program to sort and print the names of students taken from
alphabetical order.

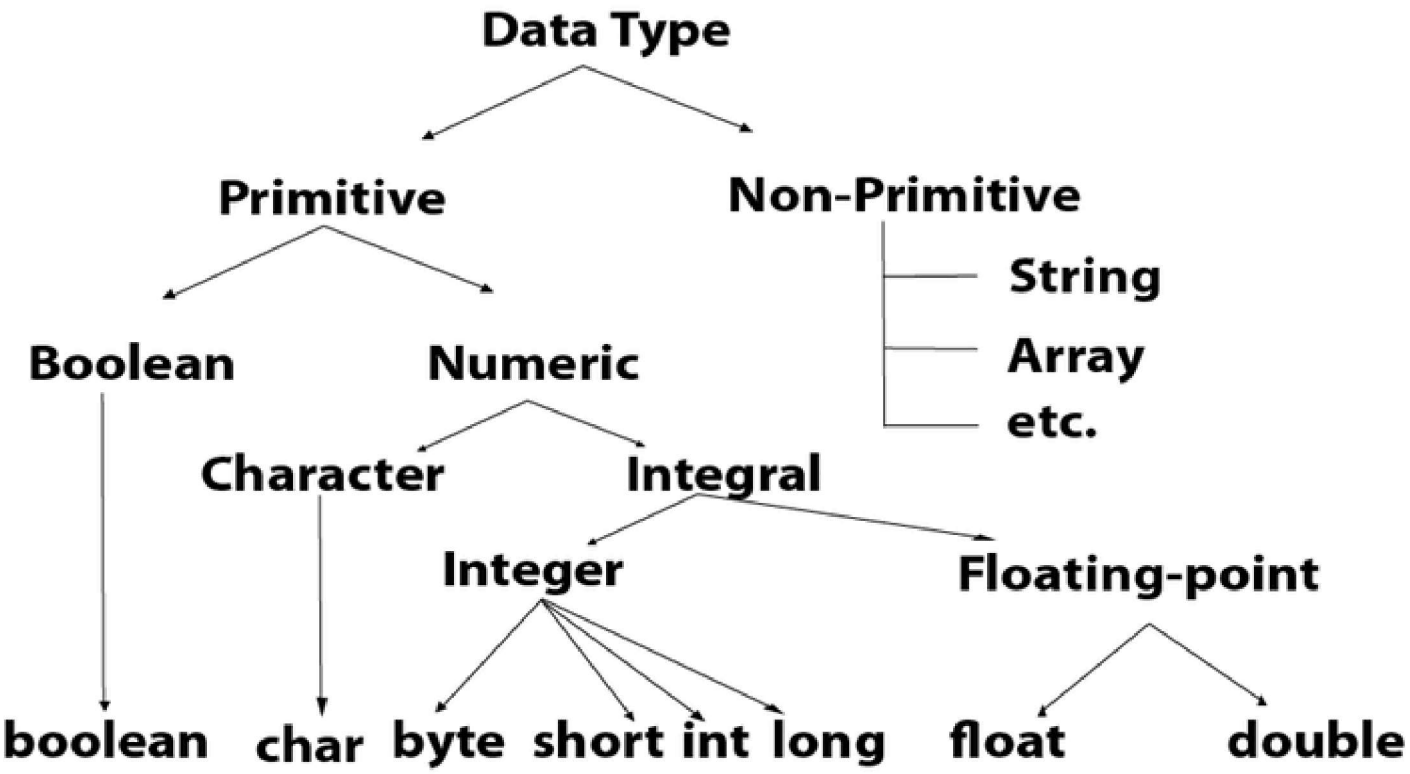
2.10 Write a program to print total numbers of vowels and consonants

2.11 Given two English words, write a program to check if the first word
word. (An anagram is a word or phrase formed by rearranging the lette
phrase, typically using all the original letters exactly once. (Example: An
RIDDLE is I AM LORD VOLDEMORT.)

2.12 Write a program to print a missing number in a sorted integer arra

2.13 Write a program to find all the pairs of numbers on an integer arra
given number.

- short data type
- int data type
- long data type
- float data type
- double data type



Boolean Data Type

The Boolean data type is used to store only two possible values: true and false. This data type is used for simple flags that t

The Boolean data type specifies one bit of information, but its "size" can't be defined precisely.

Example: Boolean one = false

Byte Data Type

The byte data type is an example of primitive data type. It isan 8-bit signed two's complement integer. Its value-range lies be
minimum value is -128 and maximum value is 127. Its default value is 0.

The byte data type is used to save memory in large arrays where the memory savings is most required. It saves space beca
integer. It can also be used in place of "int" data type.

Example: byte a = 10, byte b = -20

Short Data Type

The short data type is a 16-bit signed two's complement integer. Its value-range lies between -32,768 to 32,767 (inclusive). I
maximum value is 32,767. Its default value is 0.

Example: float f1 = 234.5f

Double Data Type

The double data type is a double-precision 64-bit IEEE 754 floating point. Its value range is unlimited. The double data type like float. The double data type also should never be used for precise values, such as currency. Its default value is 0.0d.

Example: double d1 = 12.3

Char Data Type

The char data type is a single 16-bit Unicode character. Its value-range lies between '\u0000' (or 0) to '\uffff' (or 65,535 inclus characters.

Example: char letterA = 'A'

Java Operators

In this tutorial, you'll learn about different types of operators in Java, their syntax and how to use

Operators are symbols that perform operations on variables and values. For example, `+` is an op while `*` is also an operator used for multiplication.
Operators in Java can be classified into 5 types:

1. Arithmetic Operators
2. Assignment Operators
3. Relational Operators
4. Logical Operators
5. Unary Operators
6. Bitwise Operators

---

1. Java Arithmetic Operators

Arithmetic operators are used to perform arithmetic operations on variables and data. For examp

Here, the `+` operator is used to add two variables `a` and `b`. Similarly, there are various other arithm

Operator	Operation

Here, `=` is the assignment operator. It assigns the value on its right to the variable on its left. That variable `age`.

Let's see some more assignment operators available in Java.

Operator	Example	Equivalent to
`=`	`a = b;`	`a = b;`
`+=`	`a += b;`	`a = a + b;`
`-=`	`a -= b;`	`a = a - b;`
`*=`	`a *= b;`	`a = a * b;`
`/=`	`a /= b;`	`a = a / b;`
`%=`	`a %= b;`	`a = a % b;`

3. Java Relational Operators

Relational operators are used to check the relationship between two operands. For example,

```
// check is a is less than b

a < b;
```

Here, `>` operator is the relational operator. It checks if `a` is less than `b` or not.

It returns either `true` or `false`.

Operator	Description	Example
`==`	Is Equal To	`3 == 5` returns **false**
`!=`	Not Equal To	`3 != 5` returns **true**
`>`	Greater Than	`3 > 5` returns **false**
`<`	Less Than	`3 < 5` returns **true**

Unary operators are used with only one operand. For example, `++` is a unary operator that increa
That is, `++5` will return **6**.
Different types of unary operators are:

Operator	Meaning
`+`	**Unary plus**: not necessary to use since numbers are positive without using it
`-`	**Unary minus**: inverts the sign of an expression
`++`	**Increment operator**: increments value by 1
`--`	**Decrement operator**: decrements value by 1
`!`	**Logical complement operator**: inverts the value of a boolean

Increment and Decrement Operators

Java also provides increment and decrement operators: `++` and `--` respectively. `++` increases the v
while `--` decrease it by **1**. For example,

```
int num = 5;

// increase num by 1

++num;
```

Here, the value of `num` gets increased to **6** from its initial value of **5**.

Example 5: Increment and Decrement Operators

In the above program, we have used the ++ and -- operator as **prefixes (++a, --b)**. We can also
(a++, b++).
There is a slight difference when these operators are used as prefix versus when they are used a

`<<`	Left Shift
`>>`	Right Shift
`>>>`	Unsigned Right Shift
`&`	Bitwise AND
`^`	Bitwise exclusive OR

These operators are not generally used in Java. To learn more, visit Java Bitwise and Bit Shift O

Other operators

Besides these operators, there are other additional operators in Java.

Java instanceof Operator

The `instanceof` operator checks whether an object is an instanceof a particular class.
Here, `str` is an instance of the `String` class. Hence, the `instanceof` operator returns `true`.

Java Ternary Operator

The ternary operator (conditional operator) is shorthand for the `if-then-else` statement. For example
variable = Expression ? expression1 : expression2
Here's how it works.

- If the Expression is true, expression1 is assigned to the variable.
- If the Expression is false, expression2 is assigned to the variable

Java Arrays

Arrays are used to store multiple values in a single variable, instead of declaring separate variables for each value

To declare an array, define the variable type with **square brackets**:

String[] cars;

We have now declared a variable that holds an array of strings. To insert values to it, we can use an array literal - place
inside curly braces:

Code:

2.1 Write a program to print “Hello World”.

Code:

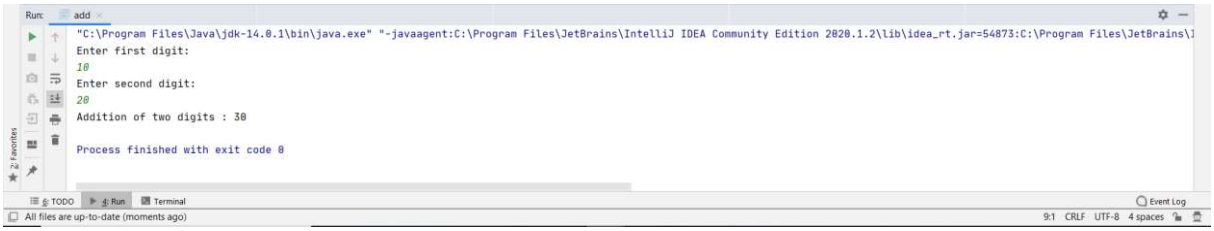
```
public class Hello {

    public static void main(String[] args) {
        System.out.println("Hello World !");
    }
}
```

Output:

2.2 Write a program to print addition of two integers.

Code:

```
import java.util.Scanner;
public class add {

    public static void main(String[] args) {

        Scanner scanner = new Scanner(System.in);

        System.out.println("Enter first digit:");

        int a = scanner.nextInt();
```

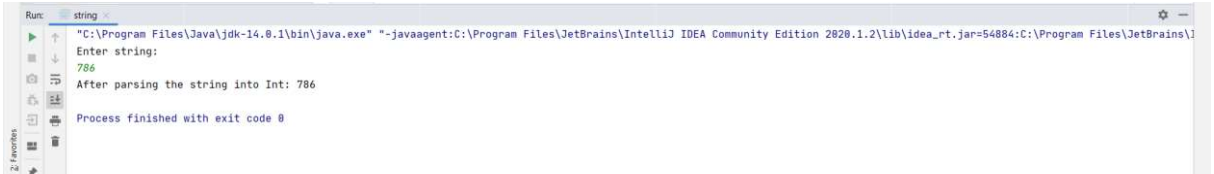


2.3 Write a program to convert a numeric string into int.

Code:

```
import java.util.Scanner;
public class string {

    public static void main(String[] args) {

        Scanner scanner = new Scanner(System.in);

        System.out.println("Enter string:");

        String s = scanner.nextLine();

        int number = Integer.parseInt(s);

        System.out.println("After parsing the string into Int: " + number);

    }

}
```

Output:



```
        num1 = Integer.parseInt(args[0]);

        num2 = Integer.parseInt(args[1]);
        sum = num1+num2;
        System.out.println(num1+" + "+num2+" = "+sum);
    }
}
```

Output:

2.5 Write a program to take two integers from command line, subtract the sm greater and print the result.

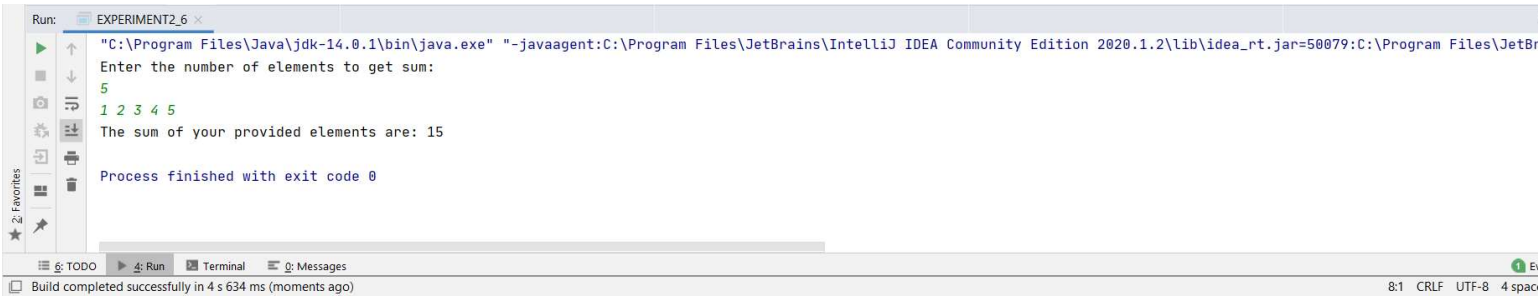
Code:

```
public class PR2_5 {

    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        int num1, num2;
         num1 = Integer.parseInt(args[0]);
         num2 = Integer.parseInt(args[1]);
        System.out.println(num1>num2 ? num1 +" - "+num2+" = "+(num1-num2)
"+(num2-num1));
    }
}
```

Output :

```
        System.out.println("Enter the number of elements to get sum:");

        int n = sc.nextInt();
        int [] arr = new int[n];
        int sum = 0;

        for(int k=0; k<arr.length; k++)
           arr[k] = sc.nextInt();

        for(int i=0; i<arr.length/2; i++){

            int result = arr[i] + arr[arr.length-1-i];
            sum += result;
        }

        if(n%2 != 0){
            int middleIndex = ((n-1)/2);
            sum += arr[middleIndex];
        }
        System.out.println("The sum of your provided elements are: "+sum);

    }
}
```

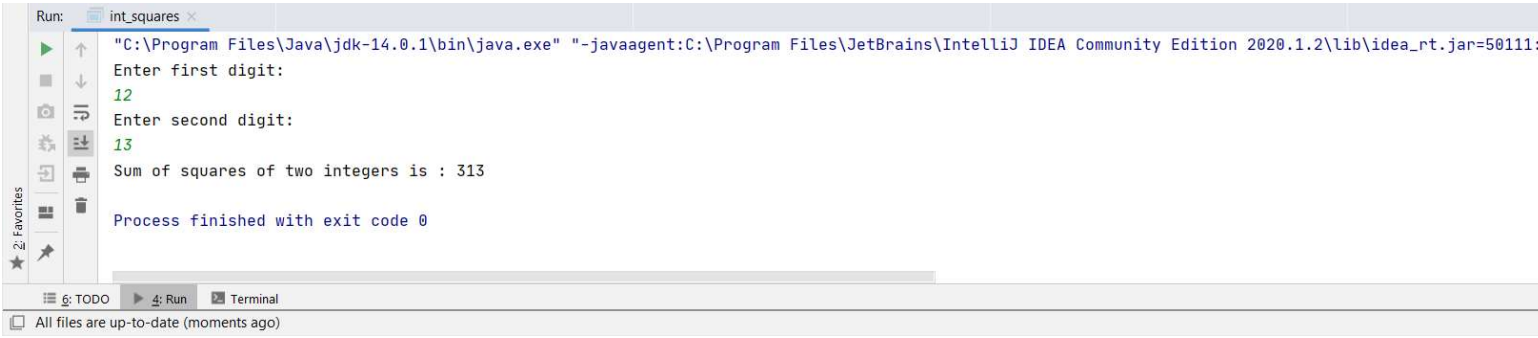
Output:



2.7 Consider any two integers. Write a program to print sum of their squares.

```
        d = c*c;
        e = b+d;
        System.out.println("Sum of squares of two integers is : " + e);
    }
}
```

Output:



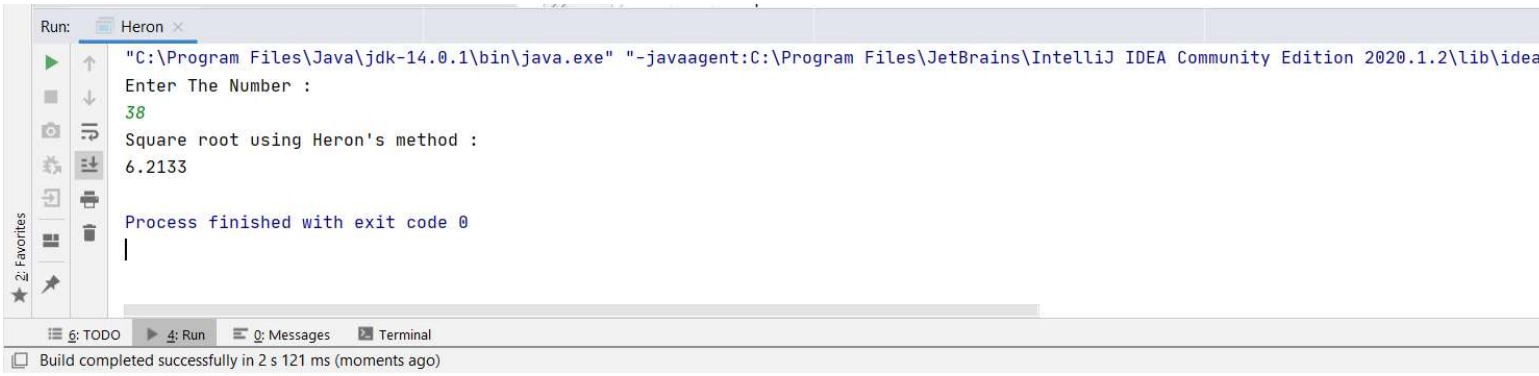
2.8 Write a program to find square root of a given positive integer using Hero root.

Code:

```
import java.util.Scanner;
public class Heron {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.println("Enter The Number : ");

        int a = scanner.nextInt();
        System.out.println((double)Math.round(heron(a) * 10000d) / 10000d);
    }

    public static int ClosetNumber(int a)   {
        int i;
```

```
        double a, i;
        a = ClosetNumber(x);
        for (i = 0; i < 4; i++)
            a = 0.5 * (a + x / a);
        return a;
    }
}
```

Output :



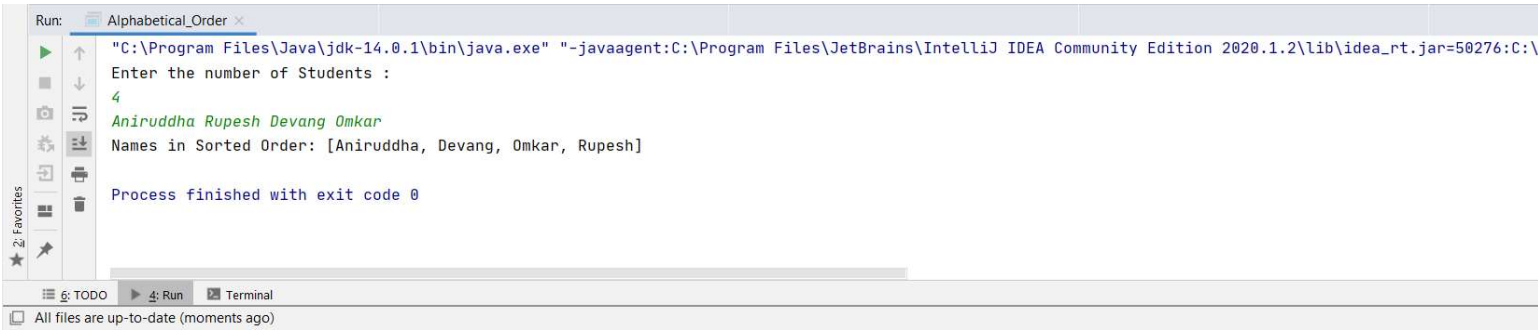
2.9 Write a program to sort and print the names of students taken from comm order.

Code :

```
import java.util.Scanner;
public class Alphabetical_Order
{
    public static void main(String[] args)
    {
        int n;
        String temp;
        Scanner s = new Scanner(System.in);
        System.out.print("Enter number of names you want to enter:");
        n = s.nextInt();
```

```
        System.out.print("Names in Sorted Order:");
        for (int i = 0; i < n - 1; i++)
        {
            System.out.print(names[i] + ",");
        }
        System.out.print(names[n - 1]);
    }
}
```

Output:



2.10 Write a program to print total numbers of vowels and consonants in a gi

Code:

```
import java.util.Scanner;


public class CountVowelConsonant {

    public static void main(String[] args) {

        Scanner sc = new Scanner(System.in);
        int vCount = 0, cCount = 0;
```

```
        System.out.println("Number of vowels: " + vCount);
        System.out.println("Number of consonants: " + cCount);
    }
}
```

Output:

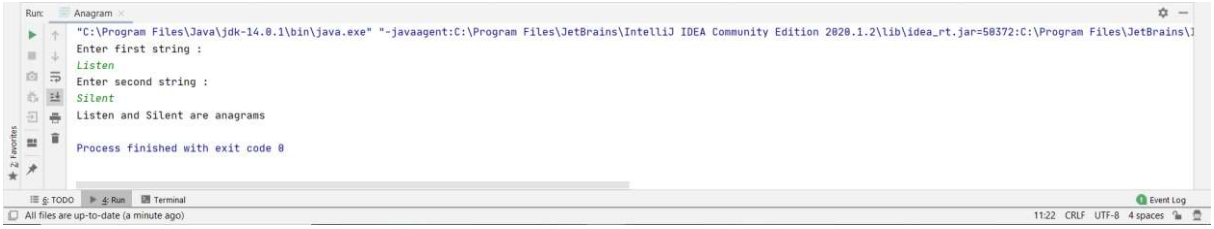
2.11 Given two English words, write a program to check if the first word is an word. (An anagram is a word or phrase formed by rearranging the letters of a phrase, typically using all the original letters exactly once. (Example: Anagram RIDDLE is I AM LORD VOLDEMORT.)

Code:

```
import java.util.Arrays;
import java.util.Scanner;

public class Anagram {

    static void areAnagram(String str1, String str2) {
        String s1 = str1.replaceAll("\\s", "");
        String s2 = str2.replaceAll("\\s", "");

        boolean status = true;
```

```
            System.out.println(str1 + " and " + str2 + " are not anagrams");
    }

    public static void main(String args[]) {
        Scanner in = new Scanner(System.in);
        System.out.println("Enter first string :");
        String str1 = in.nextLine();
        System.out.println("Enter second string :");
        String str2 = in.nextLine();
        areAnagram(str1, str2);
    }
}
```

Output:



```
        {
            mid = (a + b) / 2;
            if ((arr1[a] - a) != (arr1[mid] - mid))
                b = mid;
            else if ((arr1[b] - b) != (arr1[mid] - mid))
                a = mid;
        }
        return (arr1[mid] + 1);
    }
    public static void main (String[] args)
    {
        int array[] = { 1, 2, 3, 4, 6, 7, 8, 9, 10 };
        int size = array.length;
        System.out.println("Missing number: " + search(array, size));
    }

}
```

```java
import java.util.Scanner;


public class pairsCount {

   static void showPairs(int arr[], int n, int k) {

      for (int i = 0; i < n; i++)

         for (int j = i + 1; j < n; j++)

            if (arr[i] + arr[j] == k)

               System.out.println("(" + arr[i] + ", " + arr[j] + ")");

   }


   public static void main(String[] arg) {

      Scanner sc = new Scanner(System.in);

      System.out.println("Enter the number of elements you want to insert: ");

      int n = sc.nextInt();

      int arr[] = new int[n];

      for(int i=0; i<arr.length; i++){

         arr[i]=sc.nextInt();

      }
```

Conclusion: We understood and performed various programs using Ja

Practical no. 3

Aim:

3.1 Define the following classes/ interfaces with the help of above shortcu

1. Person(id, name, dateOfBirth, age, street, city, pin : default and pa
and setters and getters)

2. Department(id, name, dateOfEstablishment, headOfficeLocation, h
numberOfEmployees : default and parameterized constructors and s

3. Point(x, y, z : default and parameterized constructors and setters a

4. Vehicle(registrationNumber, rcBookNumber, manufacturer, numb
model, numberOfSeats : default and parameterized constructors and

5. Laptop(imeiNumber, processorName, processorSpeed, primaryMe
primaryMemoryCapacity, secondaryStorageType, secondaryStorageC
screenResolution, screenType, isLED, listOfPorts, osInstalled : default
constructors and setters and getters)

6. interface Taxable(public int cost(), public intpercentGST())

3.2 Check whether feature of Encapsulation has been followed in 3.1. If no
changes.

3.3 Define classes Car, Train and Truck with necessary member fields, cons
Make them extend class Vehicle.

3.4 Define a class Gadget with necessary member fields, constrictors and m
Laptop to extend the class Gadget.

3.5 In main method, declare a reference variable vehicle of class Vehicle a
class Car which will be referenced by vehicle. Call getName() method on th
Variable Casting)

3.6 Modify the classes Vehicle and Gadget implement the interface Taxabl
respective methods.

- Instance
- Method
- Message Passing

Object − Objects have states and behaviors. Example: A dog has states - color, name, breed the tail, barking, eating. An object is an instance of a class.

Class − A class can be defined as a template/blueprint that describes the behavior/state that

Objects in Java

Let us now look deep into what are objects. If we consider the real-world, we can find many humans, etc. All these objects have a state and a behavior.

If we consider a dog, then its state is - name, breed, color, and the behavior is - barking, wag

If you compare the software object with a real-world object, they have very similar characteris

Software objects also have a state and a behavior. A software object's state is stored in fie methods.

So in software development, methods operate on the internal state of an object and the obj done via methods.

Classes in Java

A class is a blueprint from which individual objects are created.

Following is a sample of a class.

Example

```
public class Dog {
   String breed;
   int age;
   String color;
   void barking() {
   }
   void hungry() {
   }
   void sleeping() {
   }
}
```

A class can contain any of the following variable types.

```
public class Puppy {
  public Puppy() {
  }

  public Puppy(String name) {
    // This constructor has one parameter, name.
  }
}
```

Java also supports Singleton Classes where you would be able to create only one instance c

Note − We have two different types of constructors. We are going to discuss constructors in de

Creating an Object

As mentioned previously, a class provides the blueprints for objects. So basically, an object is the new keyword is used to create new objects.

There are three steps when creating an object from a class −

- **Declaration −** A variable declaration with a variable name with an object type.
- **Instantiation −** The 'new' keyword is used to create the object.
- **Initialization −** The 'new' keyword is followed by a call to a constructor. This call initializ

An interface is a reference type in Java. It is similar to class. It is a collection of abstract methods. A clas inheriting the abstract methods of the interface.

Along with abstract methods, an interface may also contain constants, default methods, static methods, and only for default methods and static methods.

Writing an interface is similar to writing a class. But a class describes the attributes and behaviors of an object that a class implements.

Unless the class that implements the interface is abstract, all the methods of the interface need to be defined

An interface is similar to a class in the following ways −

- An interface can contain any number of methods.
- An interface is written in a file with a **.java** extension, with the name of the interface matching the nam
- The byte code of an interface appears in a **.class** file.
- Interfaces appear in packages, and their corresponding bytecode file must be in a directory structure t

However, an interface is different from a class in several ways, including −

- You cannot instantiate an interface.
- An interface does not contain any constructors.
- All of the methods in an interface are abstract.
- An interface cannot contain instance fields. The only fields that can appear in an interface must be de

- An interface is implicitly abstract. You do not need to use the **abstract** keyword while declaring an inte
- Each method in an interface is also implicitly abstract, so the abstract keyword is not needed.
- Methods in an interface are implicitly public.

Example

```
/* File name : Animal.java */

interface Animal {

   public void eat();

   public void travel();

}
```

Implementing Interfaces

When a class implements an interface, you can think of the class as signing a contract, agreeing to perform th
If a class does not perform all the behaviors of the interface, the class must declare itself as abstract.

A class uses the **implements** keyword to implement an interface. The implements keyword appears in the cla
portion of the declaration.

Example

```
/* File name : MammalInt.java */

public class MammalInt implements Animal {

   public void eat() {

      System.out.println("Mammal eats");

   }

   public void travel() {

      System.out.println("Mammal travels");

   }

   public int noOfLegs() {

      return 0;

   }

   public static void main(String args[]) {

      MammalInt m = new MammalInt();
```

- An interface can extend another interface, in a similar way as a class can extend another class.

Extending Interfaces

An interface can extend another interface in the same way that a class can extend another class. The **ext** interface, and the child interface inherits the methods of the parent interface.

The following Sports interface is extended by Hockey and Football interfaces.

Example

```
// Filename: Sports.java

public interface Sports {

   public void setHomeTeam(String name);

   public void setVisitingTeam(String name);

}



// Filename: Football.java

public interface Football extends Sports {

   public void homeTeamScored(int points);

   public void visitingTeamScored(int points);

   public void endOfQuarter(int quarter);

}

// Filename: Hockey.java

public interface Hockey extends Sports {

   public void homeGoalScored();

   public void visitingGoalScored();

   public void endOfPeriod(int period);

   public void overtimePeriod(int ot);

}
```

The Hockey interface has four methods, but it inherits two from Sports; thus, a class that implements Hockey Similarly, a class that implements Football needs to define the three methods from Football and the two metl

Extending Multiple Interfaces

```
class Person {

    int dateOfBirth, age, id, pin;
    String name, street, city;

    Person() {

    }

    Person(int a, int b, int c, int d, String s, String s2, String s3) {
        this.dateOfBirth = c;
        this.age = b;
        this.id = a;
        this.pin = d;
        this.name = s;
        this.street = s2;
        this.city = s3;
    }

    public int getDateOfBirth() {
        return dateOfBirth;
    }

    public void setDateOfBirth(int dateOfBirth) {
        this.dateOfBirth = dateOfBirth;
    }

    public String getCity() {
        return city;
    }

    public void setCity(String city) {
        this.city = city;
    }

    public String getStreet() {
        return street;
    }

    public void setStreet(String street) {
        this.street = street;
    }

    public int getPin() {
        return pin;
    }

    public void setPin(int pin) {
        this.pin = pin;
    }

    public String getName() {
        return name;
    }

    public void setName(String name) {
        this.name = name;
    }

    public int getId() {
        return id;
    }

    public void setId(int id) {
        this.id = id;
    }
```

```
        this.dateOfEstablishment = dateOfEstablishment;
        this.headOfficeLocation = headOfficeLocation;
        this.name = name;
    }

    public int getId() {
        return id;
    }

    public void setId(int id) {
        this.id = id;
    }

    public int getHeadId() {
        return headId;
    }

    public void setHeadId(int headId) {
        this.headId = headId;
    }

    public int getNumberOfEmployees() {
        return numberOfEmployees;
    }

    public void setNumberOfEmployees(int numberOfEmployees) {
        this.numberOfEmployees = numberOfEmployees;
    }

    public int getDateOfEstablishment() {
        return dateOfEstablishment;
    }

    public void setDateOfEstablishment(int dateOfEstablishment) {
        this.dateOfEstablishment = dateOfEstablishment;
    }

    public String getHeadOfficeLocation() {
        return headOfficeLocation;
    }

    public void setHeadOfficeLocation(String headOfficeLocation) {
        this.headOfficeLocation = headOfficeLocation;
    }

    public String getName() {
        return name;
    }

    public void setName(String name) {
        this.name = name;
    }


}
```

Point(x, y, z : default and parameterized constructors and setters and getter

Code :

```
class Point {
    int x, y, z;

    Point() {
```

```
}
```

4. Vehicle(registrationNumber, rcBookNumber, manufacturer, numberOfW
model, numberOfSeats : default and parameterized constructors and setter

Code :

```
class Vehicle implements Taxable {
    int registrationNumber, rcBookNumber, manufacturer, numberOfWheels, numberOfSeats;
    String vehicleType, model, name;
    int cost;

    Vehicle() {

    }

    public Vehicle(int registrationNumber, int rcBookNumber, int manufacturer, int numberOfWheel
vehicleType, String model) {
        this.registrationNumber = registrationNumber;
        this.rcBookNumber = rcBookNumber;
        this.manufacturer = manufacturer;
        this.numberOfWheels = numberOfWheels;
        this.numberOfSeats = numberOfSeats;
        this.vehicleType = vehicleType;
        this.model = model;
    }

    public int getCost() {
        return cost;
    }

    public void setCost(int cost) {
        this.cost = cost;
    }

    public String getName() {
        return name;
    }

    public void setName(String name) {
        this.name = name;
    }

    public int getRegistrationNumber() {
        return registrationNumber;
    }

    public void setRegistrationNumber(int registrationNumber) {
        this.registrationNumber = registrationNumber;
    }

    public int getRcBookNumber() {
        return rcBookNumber;
    }

    public void setRcBookNumber(int rcBookNumber) {
        this.rcBookNumber = rcBookNumber;
    }

    public int getManufacturer() {
        return manufacturer;
    }
```

```
    }

    public void setModel(String model) {
        this.model = model;
    }


    public int cost() {
        int cost = getCost();
        return cost;
    }

    public int percentGST() {
        float a = 0.18f;
        int percentGST = (int) (getCost() + (getCost() * a));
        return percentGST;
    }


}
```

5. Laptop(imeiNumber, processorName, processorSpeed, primaryMemory' primaryMemoryCapacity, secondaryStorageType, secondaryStorageCapac screenType, isLED, listOfPorts, osInstalled : default and parameterized co and getters)

Code :

```
class Laptop extends Gadget {
    int imeiNumber;
    String processorName, primaryMemoryType, secondaryStorageType, screenType;
    boolean isLED, osInstalled;
    float processorSpeed, primaryMemoryCapacity, secondaryStorageCapaciry, screenResolution;
    String listOfPorts;
    int cost;

    Laptop() {

    }

    public Laptop(int imeiNumber, String processorName, String primaryMemoryType, String seconda
screenType, boolean isLED, boolean osInstalled, float processorSpeed, float primaryMemoryCapacit
secondaryStorageCapaciry, float screenResolution, String listOfPorts) {
        this.imeiNumber = imeiNumber;
        this.processorName = processorName;
        this.primaryMemoryType = primaryMemoryType;
        this.secondaryStorageType = secondaryStorageType;
        this.screenType = screenType;
        this.isLED = isLED;
        this.osInstalled = osInstalled;
        this.processorSpeed = processorSpeed;
        this.primaryMemoryCapacity = primaryMemoryCapacity;
        this.secondaryStorageCapaciry = secondaryStorageCapaciry;
        this.screenResolution = screenResolution;
        this.listOfPorts = listOfPorts;

    }

    public boolean isLED() {
        return isLED;
    }
```

```
public String getPrimaryMemoryType() {
    return primaryMemoryType;
}

public void setPrimaryMemoryType(String primaryMemoryType) {
    this.primaryMemoryType = primaryMemoryType;
}

public String getSecondaryStorageType() {
    return secondaryStorageType;
}

public void setSecondaryStorageType(String secondaryStorageType) {
    this.secondaryStorageType = secondaryStorageType;
}

public String getScreenType() {
    return screenType;
}

public void setScreenType(String screenType) {
    this.screenType = screenType;
}

public boolean getIsLED() {
    return isLED;
}

public void setIsLED(Boolean isLED) {
    this.isLED = isLED;
}

public boolean getOsInstalled() {
    return osInstalled;
}

public void setOsInstalled(boolean osInstalled) {
    this.osInstalled = osInstalled;
}

public void setOsInstalled(Boolean osInstalled) {
    this.osInstalled = osInstalled;
}

public float getProcessorSpeed() {
    return processorSpeed;
}

public void setProcessorSpeed(float processorSpeed) {
    this.processorSpeed = processorSpeed;
}

public float getPrimaryMemoryCapacity() {
    return primaryMemoryCapacity;
}

public void setPrimaryMemoryCapacity(float primaryMemoryCapacity) {
    this.primaryMemoryCapacity = primaryMemoryCapacity;
}

public float getSecondaryStorageCapaciry() {
    return secondaryStorageCapaciry;
}

public void setSecondaryStorageCapaciry(float secondaryStorageCapaciry) {
    this.secondaryStorageCapaciry = secondaryStorageCapaciry;
}
```

```
        return percentGST;
    }

}
```

6. interface Taxable(public int cost(), public intpercentGST())

Code :

```
interface Taxable {
    int cost();

    int percentGST();
}
```

3.2 Check whether feature of Encapsulation has been followed in 3.1. If not changes.

Code :

```
public class Main {
    public static void main(String[] args) {
        Person person = new Person();
        person.setAge(45);
        person.setId(01);
        person.setName("Max");
        person.setDateOfBirth(19);
        person.setStreet("Mira road");
        person.setCity("Mumbai");
        person.setPin(409614);
        System.out.println(" id " + person.getId() + "\n name " + person.getName() + "\n age " +
birth " + person.getDateOfBirth() + "\n street name " + person.getStreet() + "\n city name " + p
+ person.getPin());
    }
}
```

Output :

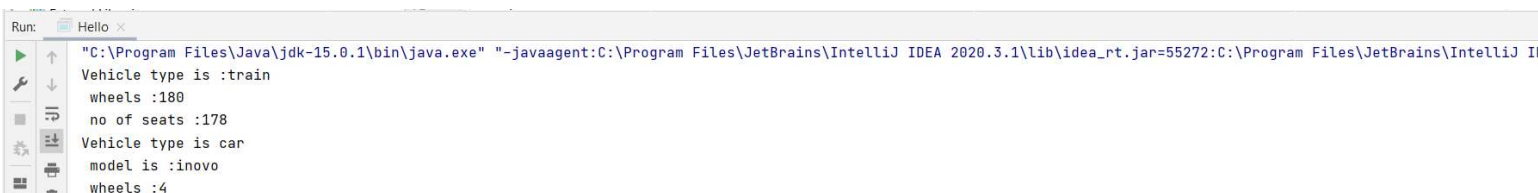
3.3 Define classes Car, Train and Truck with necessary member fields, cons
Make them extend class Vehicle

```
    public int percentGST() {
        float a = 0.18f;
        int percentGST = (int) (getCost() + (getCost() * a));
        return percentGST;
    }
}



class Train extends Vehicle {
    void show() {
        System.out.println("vehicle type is :" + getVehicleType() + "\n wheels :" + getNumberOfW
                + "\n no of seats :" + getNumberOfSeats() + "");
    }


}



class Truck extends Vehicle {


    void show() {
        System.out.println("vehicle type is :" + getVehicleType() + "\n wheels :" + getNumberOfW
                + "\n no of seats :" + getNumberOfSeats() + "");
    }
}
```

Main method :

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

    Train h = new Train();
    h.setVehicleType("train");
    h.setNumberOfSeats(178);
    h.setNumberOfWheels(180);
    h.setRegistrationNumber(90764);
    h.show();

    Car c = new Car();
    c.setVehicleType("car");
    c.setModel("inovo");
    c.setNumberOfSeats(5);
    c.setNumberOfWheels(4);
    c.setRegistrationNumber(90671);
    c.show();

    Truck t = new Truck();
    t.setVehicleType("truck");
    t.setNumberOfSeats(3);
    t.setNumberOfWheels(6);
    t.show();
}
```

Output :

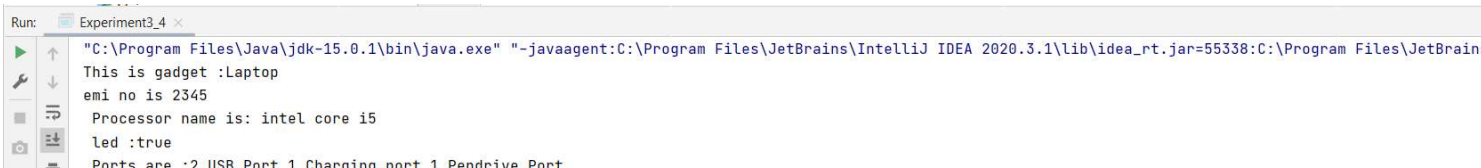


```
        this.gadgetName = gadgetName;
    }

    void disp() {
        System.out.println("The object of a class Gadget is initialized " + gadgetcount + " time
    }

    public String getGadgetName() {
        return gadgetName;
    }

    public void setGadgetName(String gadgetName) {
        this.gadgetName = gadgetName;
    }

    public int getCost() {
        return cost;
    }

    public void setCost(int cost) {
        this.cost = cost;
    }

    void Show() {
        System.out.println("This is gadget :" + getGadgetName());

    }


    public int cost() {
        int cost = getCost();
        return cost;
    }

    public int percentGST() {
        float a = 0.18f;
        int percentGST = (int) (getCost() + (getCost() * a));
        return percentGST;
    }

}
```

Main method :

```
public static void main(String args[]) {
    Laptop l = new Laptop();
    l.setGadgetName("Laptop");
    l.setImeiNumber(2345);
    l.setIsLED(true);
    l.setListOfPorts("2 USB Port,1 Charging port,1 Pendrive Port");
    l.setOsInstalled(true);
    l.setPrimaryMemoryCapacity(1500);
    l.setProcessorName("intel core i5");
    l.Show();
    l.print();
}
```

Output :



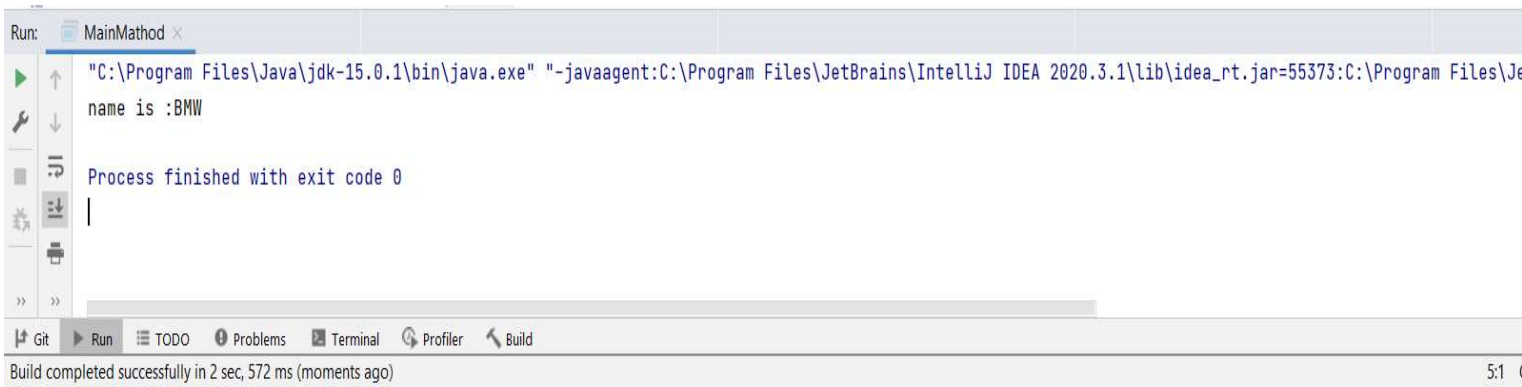
```
        this.registrationNumber = registrationNumber;
        this.rcBookNumber = rcBookNumber;
        this.manufacturer = manufacturer;
        this.numberOfWheels = numberOfWheels;
        this.numberOfSeats = numberOfSeats;
        this.vehicleType = vehicleType;
        this.model = model;
    }

    public int getCost() {
        return cost;
    }

    public void setCost(int cost) {
        this.cost = cost;
    }

    public String getName() {
        return name;
    }

    public void setName(String name) {
        this.name = name;
    }

    public int getRegistrationNumber() {
        return registrationNumber;
    }

    public void setRegistrationNumber(int registrationNumber) {
        this.registrationNumber = registrationNumber;
    }

    public int getRcBookNumber() {
        return rcBookNumber;
    }

    public void setRcBookNumber(int rcBookNumber) {
        this.rcBookNumber = rcBookNumber;
    }

    public int getManufacturer() {
        return manufacturer;
    }

    public void setManufacturer(int manufacturer) {
        this.manufacturer = manufacturer;
    }

    public int getNumberOfWheels() {
        return numberOfWheels;
    }

    public void setNumberOfWheels(int numberOfWheels) {
        this.numberOfWheels = numberOfWheels;
    }

    public int getNumberOfSeats() {
        return numberOfSeats;
    }

    public void setNumberOfSeats(int numberOfSeats) {
        this.numberOfSeats = numberOfSeats;
    }

    public String getVehicleType() {
        return vehicleType;
```

```
class Car extends Vehicle {
    int cost;

    @Override
    public int getCost() {
        return cost;
    }

    @Override
    public void setCost(int cost) {
        this.cost = cost;
    }

    void show() {
        System.out.println("Vehicle type is " + getVehicleType() + "\n model is :" + getModel()
getNumberOfWheels()
                + "\n no of seats :" + getNumberOfSeats() + "");
    }

    void disp() {
        System.out.println("name is :" + getName());
    }

    public int cost() {
        int cost = getCost();
        return cost;
    }

    public int percentGST() {
        float a = 0.18f;
        int percentGST = (int) (getCost() + (getCost() * a));
        return percentGST;
    }
}
```

Main method :

```
public static void main(String [] args)
{
    Vehicle vehicle;
    Car c1=new Car();
    c1.setName("BMW");
    c1.disp();

}
```

Output :



3.6 Modify the classes Vehicle and Gadget implement the interface Taxable

```
    public String getGadgetName() {
        return gadgetName;
    }

    public void setGadgetName(String gadgetName) {
        this.gadgetName = gadgetName;
    }

    public int getCost() {
        return cost;
    }

    public void setCost(int cost) {
        this.cost = cost;
    }

    void Show() {
        System.out.println("This is gadget :" + getGadgetName());

    }


    public int cost() {
        int cost = getCost();
        return cost;
    }

    public int percentGST() {
        float a = 0.18f;
        int percentGST = (int) (getCost() + (getCost() * a));
        return percentGST;
    }

}


class Vehicle implements Taxable {
    int registrationNumber, rcBookNumber, manufacturer, numberOfWheels, numberOfSeats;
    String vehicleType, model, name;
    int cost;

    Vehicle() {

    }

    public Vehicle(int registrationNumber, int rcBookNumber, int manufacturer, int numberOfWheel
vehicleType, String model) {
        this.registrationNumber = registrationNumber;
        this.rcBookNumber = rcBookNumber;
        this.manufacturer = manufacturer;
        this.numberOfWheels = numberOfWheels;
        this.numberOfSeats = numberOfSeats;
        this.vehicleType = vehicleType;
        this.model = model;
    }

    public int getCost() {
        return cost;
    }

    public void setCost(int cost) {
        this.cost = cost;
    }

    public String getName() {
```

```
        return numberOfWheels;
    }

    public void setNumberOfWheels(int numberOfWheels) {
        this.numberOfWheels = numberOfWheels;
    }

    public int getNumberOfSeats() {
        return numberOfSeats;
    }

    public void setNumberOfSeats(int numberOfSeats) {
        this.numberOfSeats = numberOfSeats;
    }

    public String getVehicleType() {
        return vehicleType;
    }

    public void setVehicleType(String vehicleType) {
        this.vehicleType = vehicleType;
    }

    public String getModel() {
        return model;
    }

    public void setModel(String model) {
        this.model = model;
    }


    public int cost() {
        int cost = getCost();
        return cost;
    }

    public int percentGST() {
        float a = 0.18f;
        int percentGST = (int) (getCost() + (getCost() * a));
        return percentGST;
    }


}
```

Main method :

```
public static void main(String args[]) {
    Gadget g = new Gadget();
    g.setCost(15000);
    Vehicle v = new Vehicle();
    v.setCost(55000);
    System.out.println("cost price of gadget is " + g.cost() + "/-");
    System.out.println("selling price of gadget after applying 18% GST is " + g.percentGST() + "
    System.out.println();
    System.out.println("cost price of vehicle is " + v.cost() + "/-");
    System.out.println("selling price of vehicle after applying 18% GST is " + g.percentGST() +

}
```

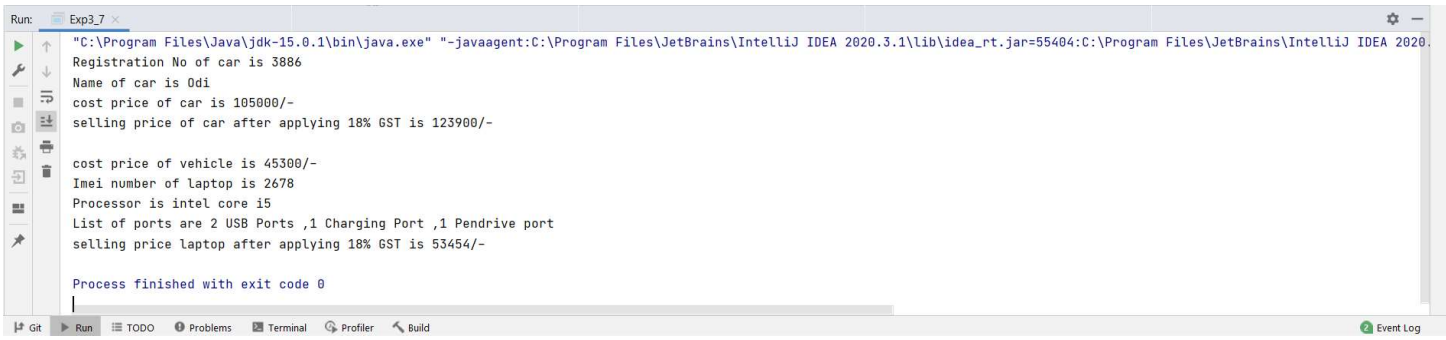
Output :

```
screenType, boolean isLED, boolean osInstalled, float processorSpeed, float primaryMemoryCapacit
secondaryStorageCapaciry, float screenResolution, String listOfPorts) {
        this.imeiNumber = imeiNumber;
        this.processorName = processorName;
        this.primaryMemoryType = primaryMemoryType;
        this.secondaryStorageType = secondaryStorageType;
        this.screenType = screenType;
        this.isLED = isLED;
        this.osInstalled = osInstalled;
        this.processorSpeed = processorSpeed;
        this.primaryMemoryCapacity = primaryMemoryCapacity;
        this.secondaryStorageCapaciry = secondaryStorageCapaciry;
        this.screenResolution = screenResolution;
        this.listOfPorts = listOfPorts;

    }

    public boolean isLED() {
        return isLED;
    }

    public void setLED(boolean LED) {
        isLED = LED;
    }

    public boolean isOsInstalled() {
        return osInstalled;
    }

    public int getCost() {
        return cost;
    }

    public void setCost(int cost) {
        this.cost = cost;
    }

    public int getImeiNumber() {
        return imeiNumber;
    }

    public void setImeiNumber(int imeiNumber) {
        this.imeiNumber = imeiNumber;
    }

    public String getProcessorName() {
        return processorName;
    }

    public void setProcessorName(String processorName) {
        this.processorName = processorName;
    }

    public String getPrimaryMemoryType() {
        return primaryMemoryType;
    }

    public void setPrimaryMemoryType(String primaryMemoryType) {
        this.primaryMemoryType = primaryMemoryType;
    }

    public String getSecondaryStorageType() {
        return secondaryStorageType;
    }

    public void setSecondaryStorageType(String secondaryStorageType) {
        this.secondaryStorageType = secondaryStorageType;
```

```
        return processorSpeed;
    }

    public void setProcessorSpeed(float processorSpeed) {
        this.processorSpeed = processorSpeed;
    }

    public float getPrimaryMemoryCapacity() {
        return primaryMemoryCapacity;
    }

    public void setPrimaryMemoryCapacity(float primaryMemoryCapacity) {
        this.primaryMemoryCapacity = primaryMemoryCapacity;
    }

    public float getSecondaryStorageCapaciry() {
        return secondaryStorageCapaciry;
    }

    public void setSecondaryStorageCapaciry(float secondaryStorageCapaciry) {
        this.secondaryStorageCapaciry = secondaryStorageCapaciry;
    }

    public float getScreenResolution() {
        return screenResolution;
    }

    public void setScreenResolution(float screenResolution) {
        this.screenResolution = screenResolution;
    }

    public String getListOfPorts() {
        return listOfPorts;
    }

    public void setListOfPorts(String listOfPorts) {
        this.listOfPorts = listOfPorts;
    }

    void print() {
        System.out.println("emi no is " + getImeiNumber() + "\n Processor name is: " + getProces
getIsLED() + "\n Ports are :" + getListOfPorts() + "\n OS :" + getOsInstalled() + "\n Meomory Ca
getPrimaryMemoryCapacity());
    }

    public int cost() {
        int cost = getCost();
        return cost;
    }

    public int percentGST() {
        float a = 0.18f;
        int percentGST = (int) (getCost() + (getCost() * a));
        return percentGST;
    }

}



class Car extends Vehicle {
    int cost;

    @Override
    public int getCost() {
        return cost;
    }
```

```
    Car c=new Car();
    c.setName("Odi");
    c.setCost(105000);
    c.setRegistrationNumber(07456);
    Laptop l=new Laptop();
    l.setCost(45300);
    l.setProcessorName("intel core i5");
    l.setImeiNumber(2678);
    l.setListOfPorts("2 USB Ports ,1 Charging Port ,1 Pendrive port ");
    System.out.println("Registration No of car is "+c.getRegistrationNumber()+"\nName of car is
car is "+c.cost()+"/-");
    System.out.println("selling price of car after applying 18% GST is "+c.percentGST()+"/-");
    System.out.println();
    System.out.println("cost price of vehicle is "+l.cost()+"/-");
    System.out.println("Imei number of laptop is "+l.getImeiNumber()+"\nProcessor is "+l.getProc
"+l.getListOfPorts()+"\nselling price laptop after applying 18% GST is "+l.percentGST()+"/-");


}
```

Output :



3.8 Modify the class Gadget to add a data member gadgetCount such that i as soon as a new object is initialized. Create 5 objects of the class Print its v each object.

Code :

```
public class Gadget implements Taxable {
    static int gadgetcount = 0;
    String gadgetName;
    int cost;

    {
        gadgetcount += 1;
    }

    Gadget() {

    }

    public Gadget(String gadgetName) {
        this.gadgetName = gadgetName;
    }

    void disp() {
        System.out.println("The object of a class Gadget is initialized " + gadgetcount + " time
    }
```

```
}
```

Main method :

```
   public static void main(String args[])
    {
        Gadget g=new Gadget();
        Gadget g1=new Gadget();
        Gadget g2=new Gadget();
        Gadget g3=new Gadget();
        Gadget g4=new Gadget();
        g.disp();
    }
}
```

Output :

Conclusion: Thus, we understood and executed various programs using classe explored various concepts related to these topics.

Practical no. 4

Aim:

4.1 Create a package com.gpm.complex. Create an interface Complex in it
methods: realPart(), imgPart(), magnitude() and argument() along with de
minus(), into() and divideBy() having appropriate parameters and return t

4.2 In the same package create class CartesianComplex with real and img
with r and theta as their member fields. Make the classes implement the
Override all non-default methods in the interface. Also override toString()

4.3 Now in main(), create one objects of both the classes defined in 4.2 an
multiplication.

4.4 Create a Java swing frame by creating a subclass of javax.swing.JFrame
java.awt.event.MouseListener by passing an object of an anonymous subc
java.awt.event.MouseAdapter on the JFrame. Display the coordinates of p
clicked

Tool used: Editor (Notepad/Intellij IDE), JDK and JRE

Theory:

Java Package

A **java package** is a group of similar types of classes, interfaces and sub-packages.

Package in java can be categorized in two form, built-in package and user-defined package.

There are many built-in packages such as java, lang, awt, javax, swing, net, io, util, sql etc.

Here, we will have the detailed learning of creating and using user-defined packages.

Advantage of Java Package

1) Java package is used to categorize the classes and interfaces so that they can be easily maintained.

2) Java package provides access protection.

3) Java package removes naming collision.

The -d switch specifies the destination where to put the generated class file. You can use any directory name (in case of windows) etc. If you want to keep the package within the same directory, you can use . (dot).

How to run java package program

You need to use fully qualified name e.g. mypack.Simple etc to run the class.

To Compile: javac -d . Simple.java

To Run: java mypack.Simple

Output:Welcome to package

The -d is a switch that tells the compiler where to put the class file i.e. it represents destination. The . repr folder.

How to access package from another package?

There are three ways to access the package from outside the package.

1. import package.*;
2. import package.classname;
3. fully qualified name.

1) Using packagename.*

If you use package.* then all the classes and interfaces of this package will be accessible but not subpackag

The import keyword is used to make the classes and interface of another package accessible to the current p

Example of package that import the packagename.*

```
//save by A.java
package pack;
public class A{
  public void msg(){System.out.println("Hello");}
}
```

```
//save by B.java
package mypack;
import pack.*;

class B{
```

```
//save by B.java
package mypack;
import pack.A;

class B{
  public static void main(String args[]){
   A obj = new A();
   obj.msg();
  }
}
```

Output:Hello

---

3) Using fully qualified name

If you use fully qualified name then only declared class of this package will be accessible. Now there is no
fully qualified name every time when you are accessing the class or interface.

It is generally used when two packages have same class name e.g. java.util and java.sql packages contain D

Example of package by import fully qualified name

```
//save by A.java
package pack;
public class A{
  public void msg(){System.out.println("Hello");}
}

//save by B.java

package mypack;
class B{
  public static void main(String args[]){
   pack.A obj = new pack.A();//using fully qualified name
   obj.msg();
  }
}
```

Output:Hello

If you import a package, all the classes and interface of that package will be imported excluding the classes
Hence, you need to import the subpackage as well.

Java JFrame

The javax.swing.JFrame class is a type of container which inherits the java.awt.Frame class. JFrame

```
        panel.add(button);
        frame.add(panel);
        frame.setSize(200, 300);
        frame.setLocationRelativeTo(null);
        frame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
        frame.setVisible(true);
    }
}
```

Code:

4.1 Create a package com.gpm.complex. Create an interface Complex in it v methods: realPart(), imgPart(), magnitude() and argument() along with def minus(), into() and divideBy() having appropriate parameters and return ty

Code :

```
package com.gpm.complex;

public interface Complex {
    void realPart();

    void imgPart();

    void magnitude();

    void argument();

    default float plus(float a, float b) {
        return a + b;
    }

    default float minus(float a, float b) {
        return a - b;
    }

    default float into(float a, float b) {
        return a * b;
    }

    default float divideBy(float a, float b) {
        return a / b;
    }

}
```

```
    @Override
    public void magnitude() {

    }

    @Override
    public void argument() {

    }

}
```

```
package com.gpm.complex;

public class PolarComplex implements Complex {
    PolarComplex r;
    PolarComplex theta;

    @Override
    public String toString() {
        return "PolarComplex";
    }

    @Override
    public void realPart() {

    }

    @Override
    public void imgPart() {

    }

    @Override
    public void magnitude() {

    }

    @Override
    public void argument() {

    }
}
```

Output :

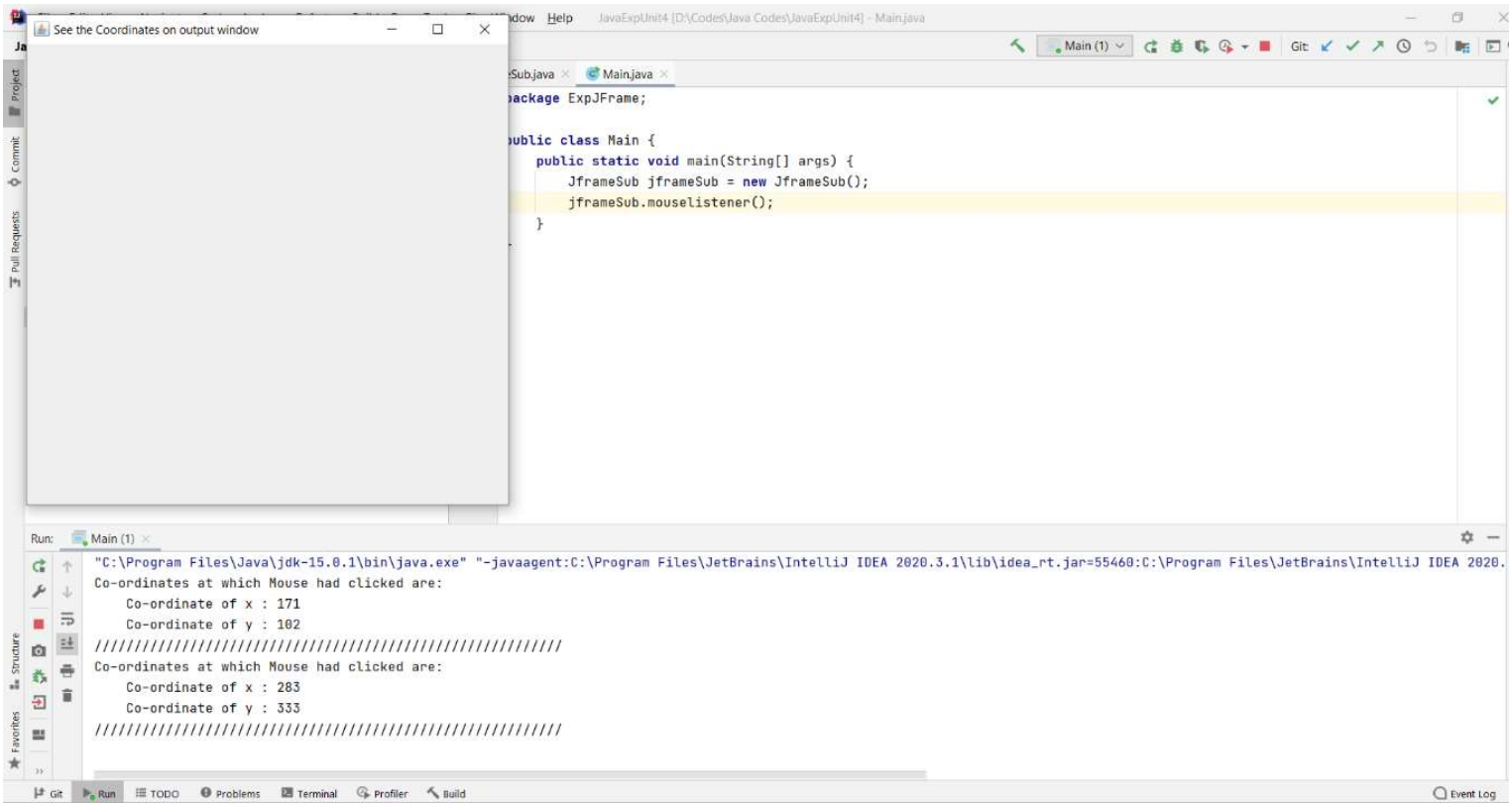
4.4 Create a Java swing frame by creating a subclass of javax.swing.JFram java.awt.event.MouseListener by passing an object of an anonymous subcla java.awt.event.MouseAdapter on the JFrame. Display the coordinates of po clicked.

Code :

```
package ExpJFrame;

import javax.swing.*;
import java.awt.event.MouseAdapter;
import java.awt.event.MouseEvent;

public class JframeSub extends JFrame {

    public JframeSub() {

    }

    public void mouselistener() {

        addMouseListener(new MouseAdapter() {
            public void mousePressed(MouseEvent e) {
                int x = e.getX();
                int y = e.getY();
                System.out.println("Co-ordinates at which Mouse had clicked are: \n" +
                        "\tCo-ordinate of x : " + x +
                        "\n\tCo-ordinate of y : " + y);
                System.out.println("////////////////////////////////////////////////////////////
            }
        });

        setTitle("See the Coordinates on output window");
        setLayout(null);
        setVisible(true);
        setSize(500, 500);
        setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);

    }
}
```

Main method :

```
package ExpJFrame;
```



Conclusion: Thus, we understood and executed programs regarding ir framework.

Practical no. 5

Aim: Using Stream API implement following programs.

- 5.1 Write a generic method to count the number of elements in a collection th (for example, odd integers, prime numbers, palindromes).
- 5.2 Write a method which takes a list of words as an argument, groups the wo returns the groupings in the form of Map>. (The keys in the map are the lengt of words of that length.)
- 5.3 Given a List<List> write a program to convert it into a List. (Hint: Use flatM interface)
- 5.4 Given: class Album{ public final String name; public final int yearOfRelease
  class Track{ public final int rating; }
  a) Write a method which takes a list of albums as an argument and returns a l sorted by the year of release.
  b) Write a method which takes a list of albums as an argument and returns a l containing at least one track having rating more than four. The returned list sh release.

Tool used: Editor (Notepad/Intellij IDE), JDK and JRE

Theory:

Stream In Java

Introduced in Java 8, the Stream API is used to process collections of objects. A s objects that supports various methods which can be pipelined to produce the desi The features of Java stream are –

- A stream is not a data structure instead it takes input from the Collections,
- Streams don't change the original data structure, they only provide the res methods.
- Each intermediate operation is lazily executed and returns a stream as a r intermediate operations can be pipelined. Terminal operations mark the en the result

3. **sorted:** The sorted method is used to sort the stream.

```
List names = Arrays.asList("Reflection","Collection","Stream");
List result = names.stream().sorted().collect(Collectors.toList());
```

Terminal Operations:

1. **collect:** The collect method is used to return the result of the intermediate the stream.

```
List number = Arrays.asList(2,3,4,5,3);
Set square = number.stream().map(x->x*x).collect(Collectors.toSet());
```

2. **forEach:** The forEach method is used to iterate through every element of

```
List number = Arrays.asList(2,3,4,5);
number.stream().map(x->x*x).forEach(y->System.out.println(y));
```

3. **reduce:** The reduce method is used to reduce the elements of a stream to The reduce method takes a BinaryOperator as a parameter.

```
List number = Arrays.asList(2,3,4,5);
int even = number.stream().filter(x->x%2==0).reduce(0,(ans,i)-> ans+i);
```

Here ans variable is assigned 0 as the initial value and i is added to it .

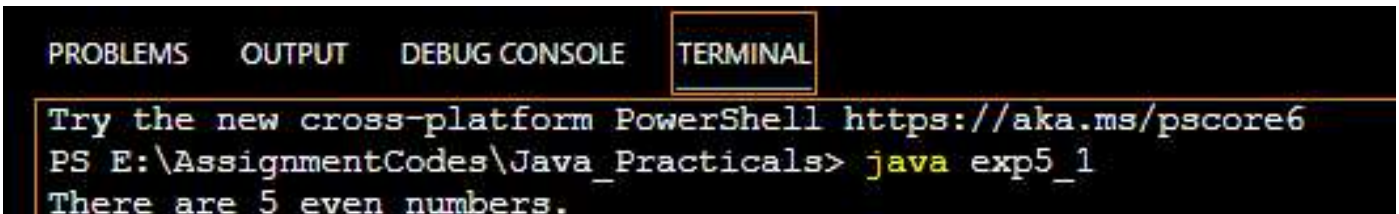
Code:

- **5.1 Write a generic method to count the number of elements in a collection that hav example, odd integers, prime numbers, palindromes).**

```
import java.util.Arrays;
import java.util.List;
import java.util.stream.Stream;


public class  exp5_1 {
```

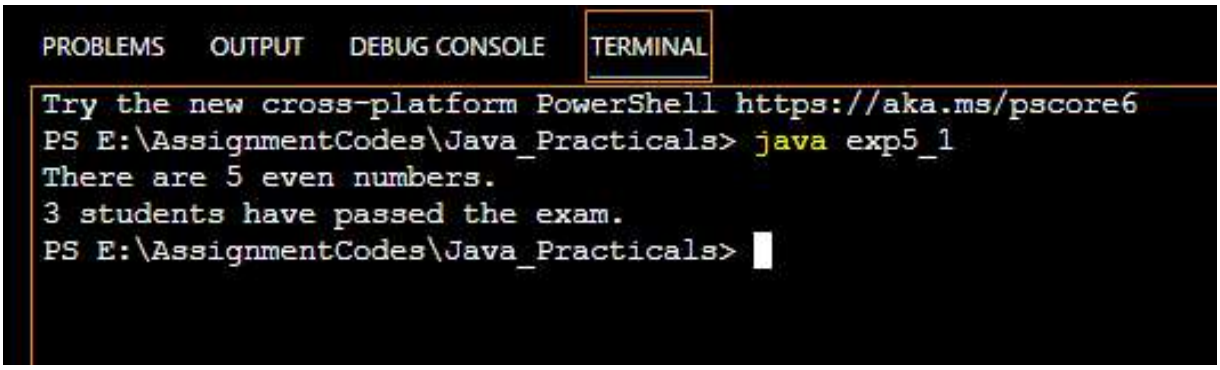
```
    }

    public static <T extends Student> long  numberOfPassedStudents(List<? extends Student> lis
        Stream<T> stream = (Stream<T>) list.stream();
        return stream.filter(student -> student.marks >= 35).count();

    }

    public static void main(String[] args) {

        Student s1 = new Student("Roy", 43, 60);
        Student s2 = new Student("Niel", 44, 49);
        Student s3 = new Student("Leo", 30, 75);
        Student s4 = new Student("lisa", 35, 30);
        Student s5 = new Student("Russ", 40, 28);

        List<Integer> list = Arrays.asList(1, 2, 3, 4, 5, 6, 7, 8, 9, 10);
        List<Student> list1 = Arrays.asList(s1, s2, s3, s4, s5);

        long evenNumbers = evenNumbers(list) ;
        long numberOfPassedStudents = numberOfPassedStudents(list1) ;

        System.out.println("There are "+ evenNumbers +" even numbers.");
        System.out.println(numberOfPassedStudents+" students have passed the exam.");
    }
}
```

Output:



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

        // create a list

    List<String> strings = Arrays.asList("this", "is", "a", "long", "list", "of",
            "strings", "to", "use", "as", "a", "trial");

    stream = strings.stream();
    Map<Integer, List<String>> lengthMap = stream.collect(Collectors.groupingBy(Strin

    lengthMap.forEach((k,v) -> System.out.printf("%d: %s%n", k, v));
    }
}
```

Output:



- **5.3 Given a List<List> write a program to convert it into a List. (Hint: Use fla interface)**

```
import java.util.*;

import java.util.stream.*;

class exp5_3 {

    public static void main(String[] args) {

        ArrayList<String> list1 = new ArrayList();
```

```
        System.out.println("LIST1 : " + list1);
        System.out.println("LIST2 : " + list2);
        System.out.println("LIST<LIST<String>> :" + listOflist);

        ArrayList<String> result = new ArrayList();
        listOflist.forEach(result::addAll);

        System.out.println("RESULT : " + result);
    }
}
```

```
PROBLEMS 453   OUTPUT   DEBUG CONSOLE   TERMINAL
PS E:\AssignmentCodes\Java_Practicals> java exp5_3
LIST1 : [Government, Polytechnic, Mumbai]
LIST2 : [A.Y. Jung Marg, Kherwadi, Bandra (E)]
LIST<LIST<String>> :[[Government, Polytechnic, Mumbai], [A.Y. Jung Marg, Khe
RESULT : [Government, Polytechnic, Mumbai, A.Y. Jung Marg, Kherwadi, Bandra
PS E:\AssignmentCodes\Java_Practicals>
```

- **5.4 Given: class Album{ public final String name; public final int yearOfRele tracks;**

  class Track{ public final int rating; }

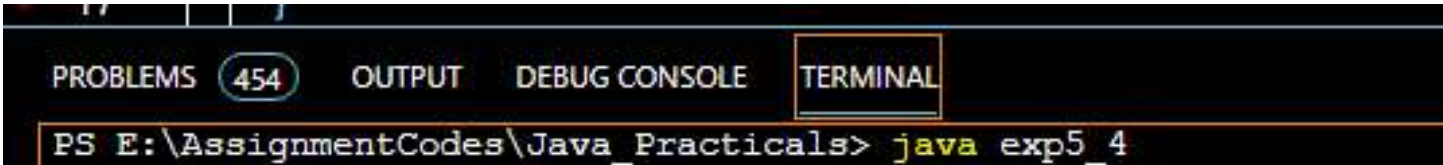
  a) Write a method which takes a list of albums as an argument and returns albums sorted by the year of release.

  b) Write a method which takes a list of albums as an argument and returns albums containing at least one track having rating more than four. The retu

```
    public String toString(){
        return this.name + " (" + this.rating + ") ";
    }
}
static class Album{
    public final String name;
    private final List<Track> tracks;
    private int yearOfRelease;
    public int getYear(){
        return yearOfRelease;
    }
    public List<Track> getTracks(){
        return tracks;
    }
    public int maxRating(){
        Track maxTrack = tracks.stream().reduce(new Track("temp",0), (ma
            if(maxTrackYet.rating < currTrack.rating)
                return currTrack;
            return maxTrackYet;
        });
        return maxTrack.rating;
    }
    public Album(String name, List<Track> trackList, int yearOfRelease){
        this.name = name;
```

```
    List<String> sortedList = new ArrayList<>();
    for(Object obj : sorted)
        sortedList.add(String.valueOf(obj));
    return sortedList;
}

static public List<String> filterGoodAlbums(List<Album> albums){
    List<String> goodAlbums = new ArrayList<>();
    albums.stream().forEach(album -> {
        if(album.maxRating() >4)
            goodAlbums.add(album.toString());
    });
     return goodAlbums;
}

public  static void main(String[] args) {
    System.out.println();
    // Preparing albums and tracks
    String[] travelNames = {"Ve maahi", "Duniya", "Bolna", "Kabira", "Vaa
    int[] travelRatings= {5,6,4,8,5};
    List<Track> travelSongs = new  ArrayList<>();
    for(int i=0; i<travelNames.length; i++)
        travelSongs.add(new Track(travelNames[i], travelRatings[i]));
    Album travelAlbum = new Album("Travel",travelSongs, 2009);
```

```
        for(int i=0; i<hipHopNames.length; i++)
            hipHopSongs.add(new Track(hipHopNames[i], hiphopRatings[i]));
        Album hipHopAlbum = new Album("Hip hop",hipHopSongs, 2017);


        String[] jazzNames = {"Sham", "Masakali","Lovely"};
        int[] jazzRatings = {3,1,2};
        List<Track> jazzSongs = new  ArrayList<>();
        for(int i=0; i<jazzNames.length; i++)
           jazzSongs.add(new Track(jazzNames[i], jazzRatings[i]));
        Album jazzAlbum = new Album("Jazz",jazzSongs, 1995);


        List<String> sortedAlbums =  sortAlbumsByYear(Arrays.asList(travelAl
hipHopAlbum, rapAlbum));
        System.out.println("Sorted list of albums by their year of release: \n"+


        List<String> goodAlbums =  filterGoodAlbums(Arrays.asList(travelAlbu
hipHopAlbum, rapAlbum));
        System.out.println("Sorted list of Good albums(rating>4) by their yea
\n"+goodAlbums);


    }
}
```



Practical no. 6

Aim: Implement programs related to File I/O

- 6.1 Create a csv file which will contain 10 integers in a spreadsheet. Read the file and display the sum of the numbers in the file. Handle all possible exceptions. W read and modify a file.
- 6.2 Create two objects of class Path viz., source and target. Perform the followin source b. Copy a file from source to target c. Move a file from source to target d. Retrieve information about source and target

Tools used: Editor (Notepad/Intellij IDE), JDK and JRE

Theory:

Java file I/O

Java I/O (Input and Output) is used *to process the input* and *produce the output*.

Java uses the concept of a stream to make I/O operation fast. The java.io package contains all the classes required fo

We can perform **file handling in Java** by Java I/O API.

The two important streams are **FileInputStream** and **FileOutputStream**

FileInputStream

This stream is used for reading data from the files. Objects can be created using the keyw types of constructors available.

Following constructor takes a file name as a string to create an input stream object to read th

```
InputStream f = new FileInputStream("C:/java/hello");
```

Following constructor takes a file object to create an input stream object to read the file. Fir File() method as follows −

```
File f = new File("C:/java/hello");
InputStream f = new FileInputStream(f);
```

Once you have *InputStream* object in hand, then there is a list of helper methods which can do other operations on the stream.

Directories in Java

A directory is a File which can contain a list of other files and directories. Yo
directories, to list down files available in a directory. For complete detail, check a l
you can call on File object and what are related to directories.

Creating Directories

There are two useful **File** utility methods, which can be used to create directories

- The **mkdir( )** method creates a directory, returning true on success and false
  that the path specified in the File object already exists, or that the directory
  the entire path does not exist yet.
- The **mkdirs()** method creates both a directory and all the parents of the direc

Code:

- **Create a csv file which will contain 10 integers in a spreadsheet. Read the f
  java.util.Scanner and display the sum of the numbers in the file. Handle all
  Write a Java program to create, read and modify a file.**

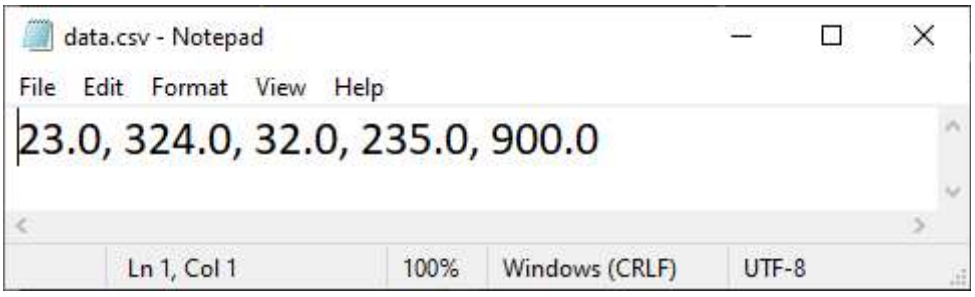
```
import java.util.*;
import java.io.*;


public class exp6_1 {
    public static void main(String[] args) {
        double sum = 0;
        List<Double> numbers = new ArrayList<>();


        String dataFilePath = "data.csv";
        String defaultData = "200,500,25,50\n100,50,25\n70,30,40,60\n40\n60,90,150
        Scanner inputScanner = new Scanner(System.in);
        char opted;
```

```
            defauFileWriter.close();
        } else
            System.out.println("There was a problem creating new file, try creating

    } catch (Exception e) {
        System.out.println("An error occurred while writing default data to the file
        e.printStackTrace();
    }
}

// Find sum of all numbers in csv file
// All numbers in CSV file:

displaySum(dataFile, sum, numbers);

// Modify the numbers in csv file

System.out.print("Do you want to write numbers to csv file? y/n: ");
opted = inputScanner.nextLine().trim().charAt(0);
if (opted == 'y' || opted == 'Y') {
    int n;
    double entity;
    System.out.println("How many decimal numbers do you wish to write to file
    n = inputScanner.nextInt();
    System.out.println("Enter the numbers separated by spaces:");
    List<Double> newData = new ArrayList<>();
```

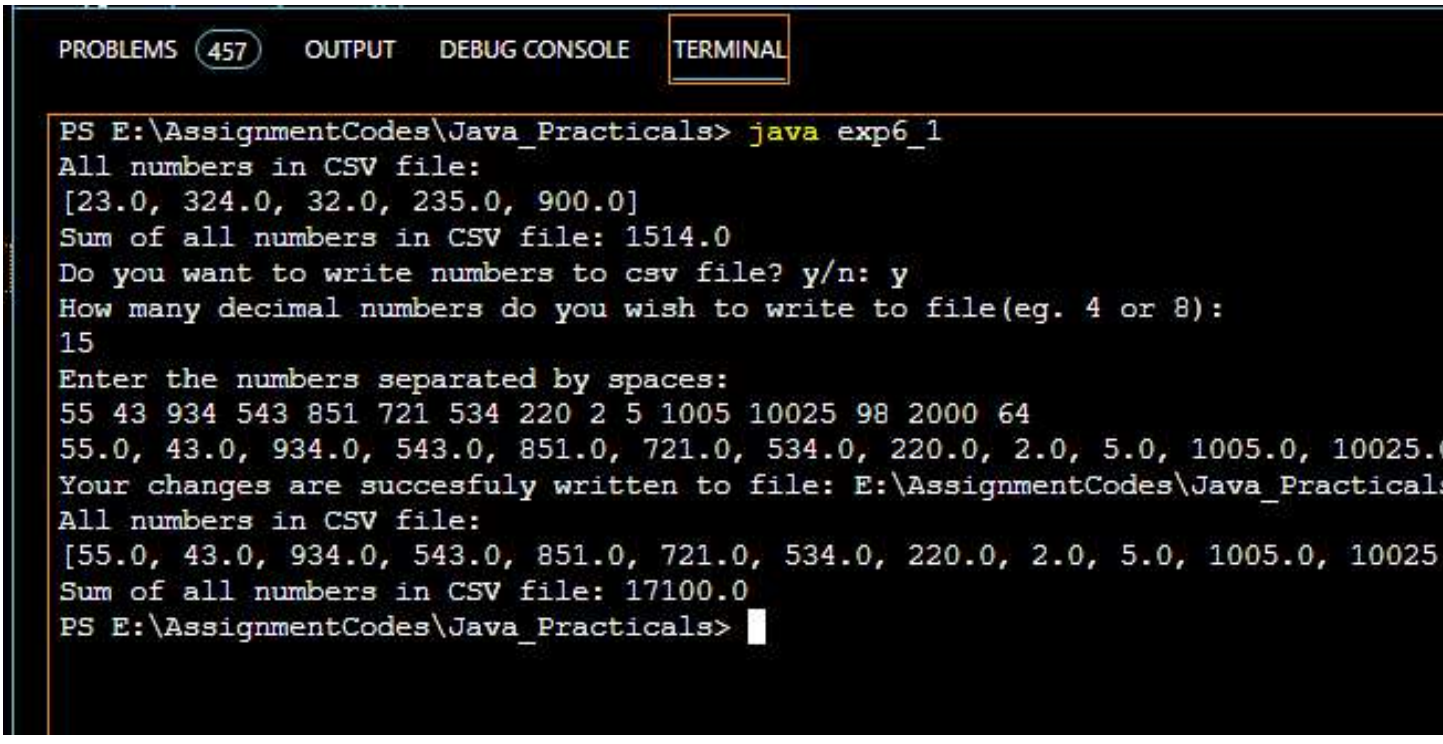
```
            System.out.println("Your changes are succesfuly written to file: " + dataFil
        } catch (Exception e) {
            System.out.println("xxxxxx ERROR xxxxxxxxx::: Close the CSV file And Try A
            e.printStackTrace();
        }
    }
    numbers.clear();
    sum = 0;
    displaySum(dataFile, sum, numbers);                    // All numbers in CSV file:
    inputScanner.close();
}

private static void displaySum(File dataFile, double sum, List<Double> numbers) {
    try {
        Scanner csvScanner = new Scanner(dataFile);
        Scanner dataScanner = null;
        while (csvScanner.hasNextLine()) {
            dataScanner = new Scanner(csvScanner.nextLine());
            dataScanner.useDelimiter(",");

            while (dataScanner.hasNext()) {
                try {
                    String data = dataScanner.next().trim();
                    numbers.add(Double.parseDouble(data));
                    sum += Double.parseDouble(data);
                } catch (NumberFormatException ne) {
```

```
        System.out.println("Sum of all numbers in CSV file: " + sum);
    }
}
```

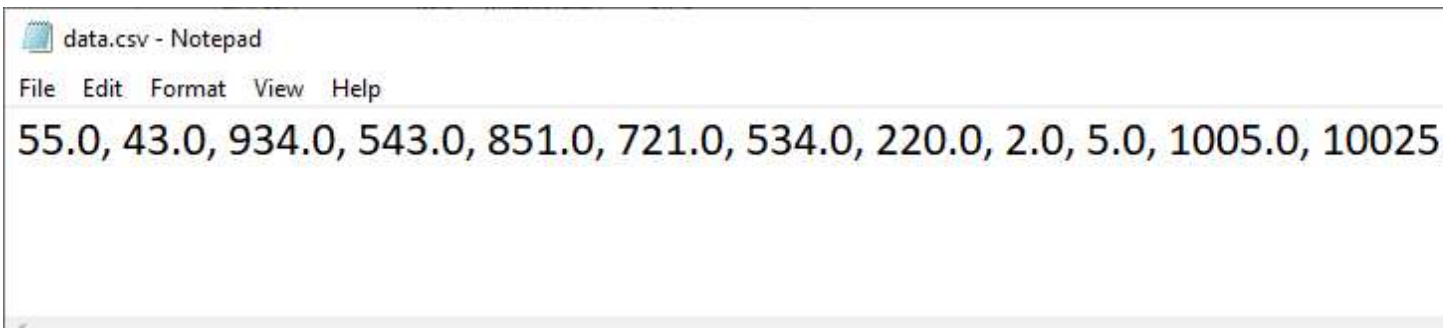
Previous CSV file:



Output:



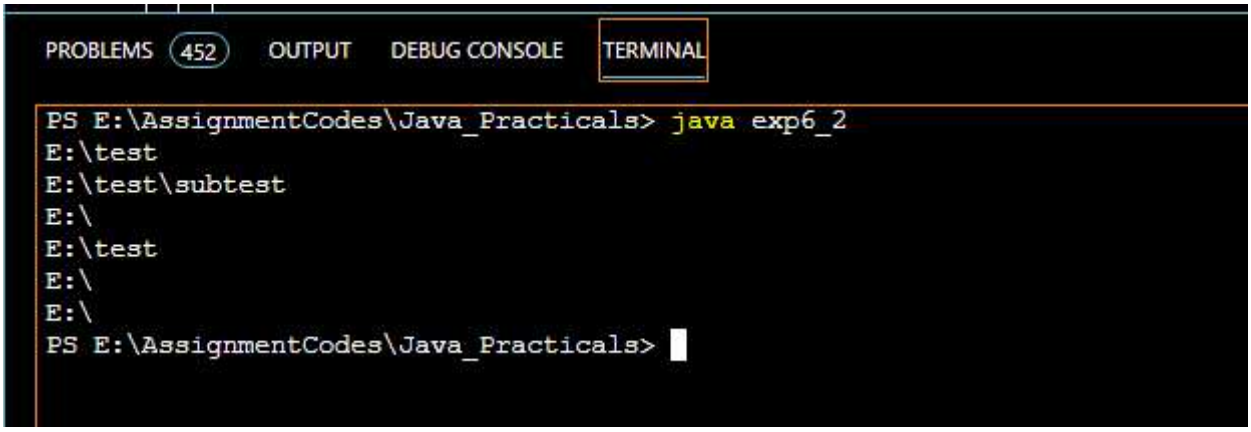
CSV file after modifications:

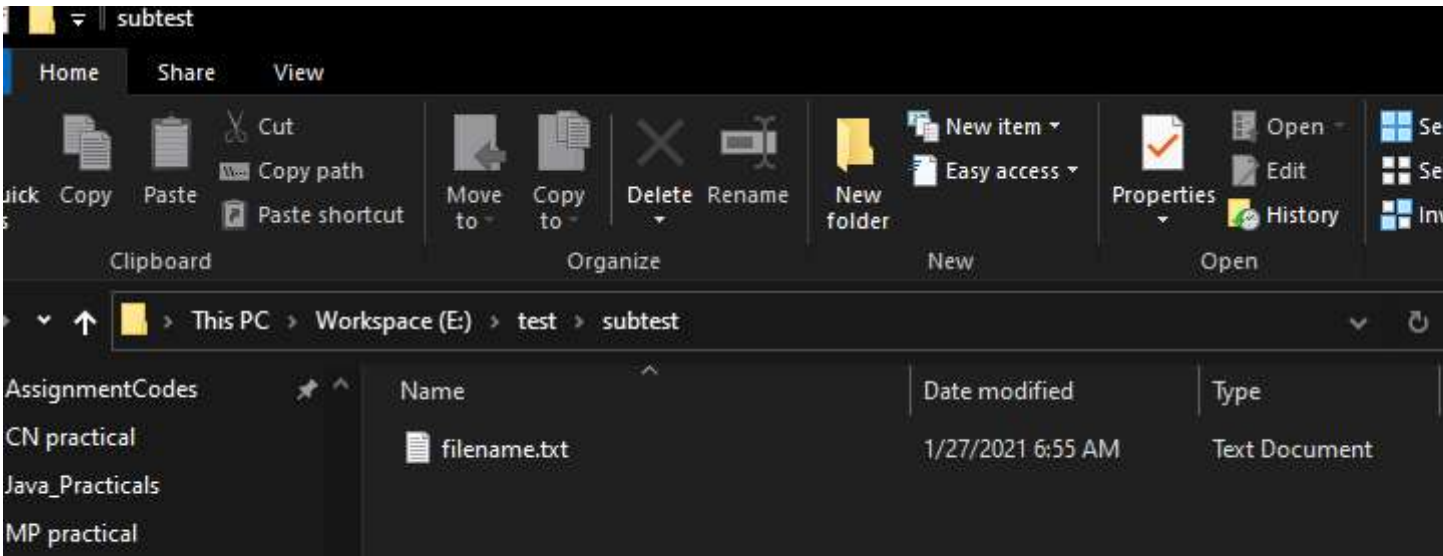


```
try{
   Path source = Paths.get("E:\\test");
   Path target = Paths.get("E:\\test\\subtest");

   String fn1=source+"\\";
   String fn2=target+"\\";

   FileWriter myWriter = new FileWriter(fn1+"filename.txt");
   myWriter.write("Files in Java might be tricky, but it is fun enough!")
   myWriter.close();


   //copy
   InputStream is = null;
   OutputStream os = null;
   File s=new File(fn1+"filename.txt");
   File d=new File(fn2+"filename.txt");
   is = new FileInputStream(s);
   os = new FileOutputStream(d);
   byte[] buffer = new byte[1024];
   int length;
   while ((length = is.read(buffer)) > 0) {
      os.write(buffer, 0, length);
   }
```

```
            System.out.println(source+"");
            System.out.println(target+"");
            System.out.println(source.getParent()+"");
            System.out.println(target.getParent()+"");
            System.out.println(source.getRoot()+"");
            System.out.println(target.getRoot()+"");
        }catch(Exception ex){
            System.out.println(ex+"");
        }
    }
}
```

Output:





Practical no. 7

Aim: Generate complete Javadocs for any two of the above experiments

Tool used: Editor (Notepad/Intellij IDE), JDK and JRE

Theory:

Javadoc

Javadoc is a tool which comes with JDK and it is used for generating Java code documenta
source code, which requires documentation in a predefined format.

Following is a simple example where the lines inside /*….*/ are Java multi-line comments. Si
// is Java single-line comment.

Example

```
/**

* The HelloWorld program implements an application that

* simply displays "Hello World!" to the standard output.

*

* @author  Omkar Phansopkar

* @version 1.0

* @since   2014-03-31

*/

public class HelloWorld {

   public static void main(String[] args) {

      // Prints Hello, World! on standard output.

      System.out.println("Hello World!");

   }

}
```

You can include required HTML tags inside the description part. For instance, the following example makes u
<p> has been used for creating paragraph break −

```
*/
public class HelloWorld {


   public static void main(String[] args) {
      // Prints Hello, World! on standard output.
      System.out.println("Hello World!");
   }
}
```

The javadoc Tags

The javadoc tool recognizes the following tags −

Tag	Description	Syntax
@author	Adds the author of a class.	@author name-text
{@code}	Displays text in code font without interpreting the text as HTML markup or nested javadoc tags.	{@code text}
{@docRoot}	Represents the relative path to the generated document's root directory from any generated page.	{@docRoot}
@deprecated	Adds a comment indicating that this API should no longer be used.	@deprecated deprecatedtext
@exception	Adds a **Throws** subheading to the generated documentation, with the classname and description text.	@exception class-name description

	the "Parameters" section.	
@return	Adds a "Returns" section with the description text.	@return description
@see	Adds a "See Also" heading with a link or text entry that points to reference.	@see reference
@serial	Used in the doc comment for a default serializable field.	@serial field-description | include | exclude
@serialData	Documents the data written by the writeObject( ) or writeExternal( ) methods.	@serialData data-description
@serialField	Documents an ObjectStreamField component.	@serialField field-name field-type field-description
@since	Adds a "Since" heading with the specified since-text to the generated documentation.	@since release
@throws	The @throws and @exception tags are synonyms.	@throws class-name description
{@value}	When {@value} is used in the doc comment of a static field, it displays the value of that constant.	{@value package.class#field}
@version	Adds a "Version" subheading with the specified version-text to the generated docs when the -version option is used.	@version version-text

```
public class exp7a{
   /**
    * in this method we are taking the numbers as input and returning the addti
    * @param x;
    * @return to main;
    */
   public static int add(int ...x)
   {
      return x[0]*x[0]+x[1]*x[1];
   }
   /**
    * this is the main method where the calling to add function is done and print
    * @param args
    */
   public static void main(String args[])
   {  //creating Scanner class object and passing system.in ;
      Scanner sc= new Scanner(System.in);
      System.out.println("enter the first number:");
      int n1=sc.nextInt();
      System.out.println("enter the second number:");
      int n2=sc.nextInt();
      int a=exp7a.add(n1,n2);
      System.out.print("the addtion of square root of indivisual is :"+a);
   }
```

```
    *@param args
    */
   public static void main(String args[])
   {
       System.out.println("sorting the array.....");
       System.out.println("sorted array:");
       Arrays.sort(args);
       for(String i:args)
       {
          System.out.println(i);
       }
   }
}
```

Generating docs:
Perform following commands to generate doc:
javadoc -d .\pathToDestination .\pathToSrc.java file.

Actual commands:

javadoc -d .\javadocs\ .\exp7a.java

javadoc -d .\javadocs\ .\exp7b.java

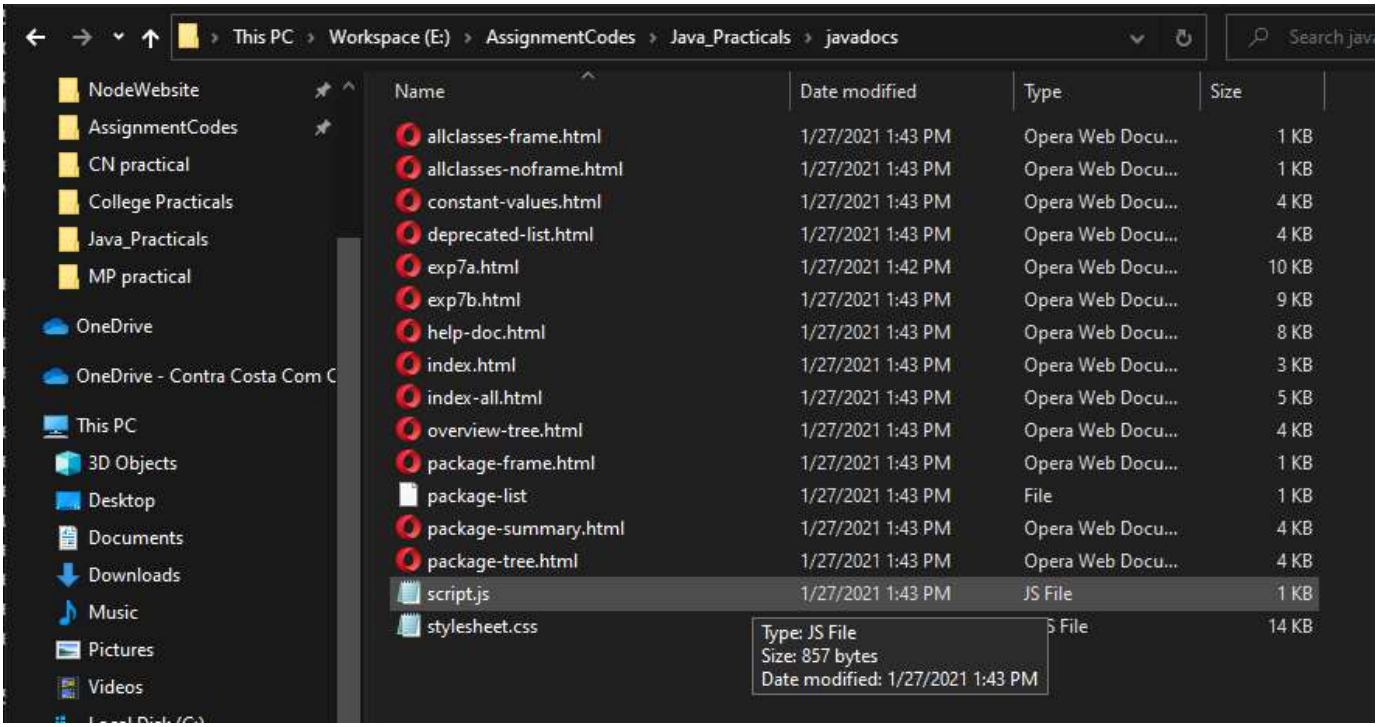
Windows PowerShell

```
PS E:\AssignmentCodes\Java_Practicals> javadoc -d .\javadocs\ .\exp7a.java
Loading source file .\exp7a.java...
Constructing Javadoc information...
Standard Doclet version 1.8.0_251
Building tree for all the packages and classes...
Generating .\javadocs\exp7a.html...
.\exp7a.java:17: warning: no description for @param
     * @param args
       ^
Generating .\javadocs\package-frame.html...
Generating .\javadocs\package-summary.html...
Generating .\javadocs\package-tree.html...
Generating .\javadocs\constant-values.html...
Building index for all the packages and classes...
Generating .\javadocs\overview-tree.html...
Generating .\javadocs\index-all.html...
Generating .\javadocs\deprecated-list.html...
Building index for all classes...
Generating .\javadocs\allclasses-frame.html...
Generating .\javadocs\allclasses-noframe.html...
Generating .\javadocs\index.html...
Generating .\javadocs\help-doc.html...
1 warning
PS E:\AssignmentCodes\Java_Practicals>
```

Windows PowerShell

```
PS E:\AssignmentCodes\Java_Practicals> javadoc -d .\javadocs\ .\exp7b.java
Loading source file .\exp7b.java...
Constructing Javadoc information...
Standard Doclet version 1.8.0_251
Building tree for all the packages and classes...
Generating .\javadocs\exp7b.html...
.\exp7b.java:8: warning: no description for @param
    *@param args
     ^
Generating .\javadocs\package-frame.html...
Generating .\javadocs\package-summary.html...
Generating .\javadocs\package-tree.html...
Generating .\javadocs\constant-values.html...
Building index for all the packages and classes...
Generating .\javadocs\overview-tree.html...
Generating .\javadocs\index-all.html...
Generating .\javadocs\deprecated-list.html...
Building index for all classes...
Generating .\javadocs\allclasses-frame.html...
Generating .\javadocs\allclasses-noframe.html...
Generating .\javadocs\index.html...
```

Docs Output:


This PC › Workspace (E:) › AssignmentCodes › Java_Practicals › javadocs
Search java
NodeWebsite
AssignmentCodes
CN practical
College Practicals
Java_Practicals
MP practical
OneDrive
OneDrive - Contra Costa Com C
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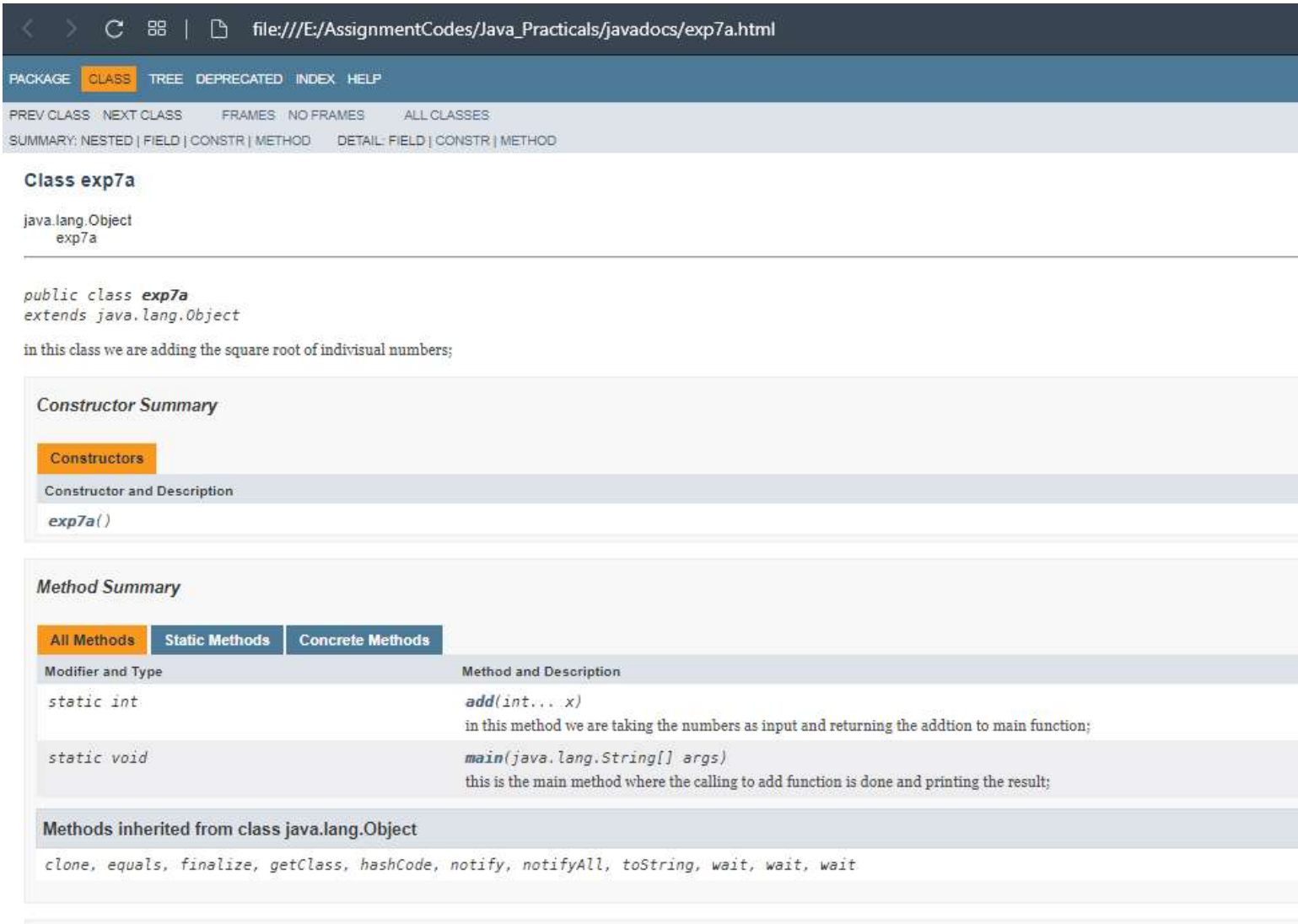
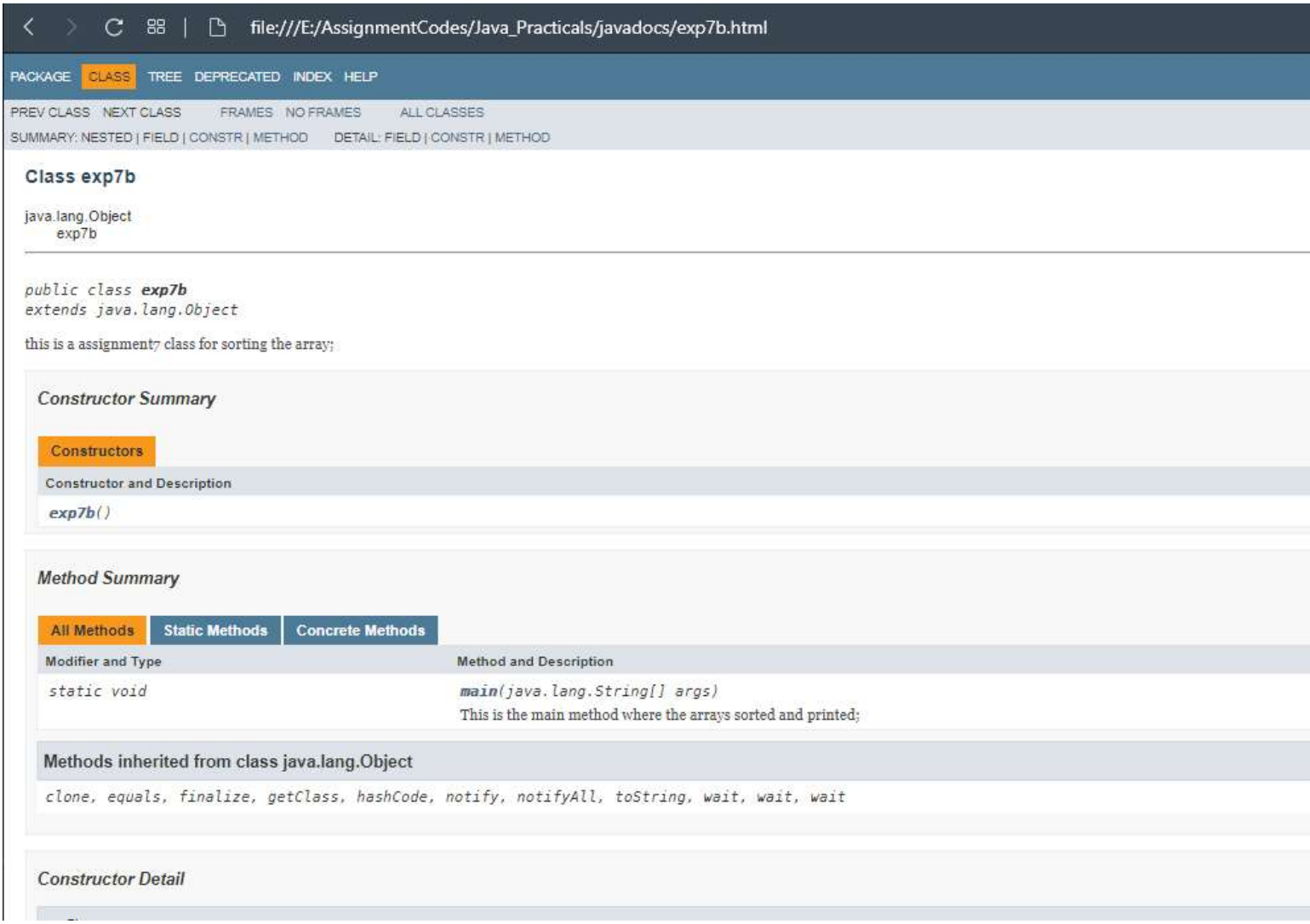
3D Objects
Desktop
Documents
Downloads
Music
Pictures
Videos
Name
Date modified
Type
Size
allclasses-frame.html 1/27/2021 1:43 PM Opera Web Docu... 1 KB
allclasses-noframe.html 1/27/2021 1:43 PM Opera Web Docu... 1 KB
constant-values.html 1/27/2021 1:43 PM Opera Web Docu... 4 KB
deprecated-list.html 1/27/2021 1:43 PM Opera Web Docu... 4 KB
exp7a.html 1/27/2021 1:42 PM Opera Web Docu... 10 KB
exp7b.html 1/27/2021 1:43 PM Opera Web Docu... 9 KB
help-doc.html 1/27/2021 1:43 PM Opera Web Docu... 8 KB
index.html 1/27/2021 1:43 PM Opera Web Docu... 3 KB
index-all.html 1/27/2021 1:43 PM Opera Web Docu... 5 KB
overview-tree.html 1/27/2021 1:43 PM Opera Web Docu... 4 KB
package-frame.html 1/27/2021 1:43 PM Opera Web Docu... 1 KB
package-list 1/27/2021 1:43 PM File 1 KB
package-summary.html 1/27/2021 1:43 PM Opera Web Docu... 4 KB
package-tree.html 1/27/2021 1:43 PM Opera Web Docu... 4 KB
script.js 1/27/2021 1:43 PM JS File 1 KB
stylesheet.css 14 KB
Type: JS File
Size: 857 bytes
Date modified: 1/27/2021 1:43 PM


file:///E:/AssignmentCodes/Java_Practicals/javadocs/exp7a.html
PACKAGE CLASS TREE DEPRECATED INDEX HELP
PREV CLASS NEXT CLASS FRAMES NO FRAMES ALL CLASSES
SUMMARY: NESTED | FIELD | CONSTR | METHOD DETAIL: FIELD | CONSTR | METHOD
Class exp7a
java.lang.Object
exp7a
public class exp7a
extends java.lang.Object
in this class we are adding the square root of indivisual numbers;
Constructor Summary
Constructors
Constructor and Description
exp7a()
Method Summary
All Methods Static Methods Concrete Methods
Modifier and Type
Method and Description
static int
add(int... x)
in this method we are taking the numbers as input and returning the addtion to main function;
static void
main(java.lang.String[] args)
this is the main method where the calling to add function is done and printing the result;
Methods inherited from class java.lang.Object
clone, equals, finalize, getClass, hashCode, notify, notifyAll, toString, wait, wait, wait



Conclusion: Thus we understood and successfully created javadocs fo
various techniques used for commenting and documenting java exper