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Week: **6**

1. Design **an abstract class having two methods. Create Rectangle and Triangle classes by inheriting** the **shape class and override the above methods to suitably implement for Rectangle and Triangle class.**

Code: abstract class Shape {

```
}
     public abstract double calculateArea();
     public abstract double calculate Perimeter();

class Rectangle extends Shape {
    private double length;
    private double width;



    }
     public Rectangle(double length, double width) {
         this.length = length;
         this.width = width;

     public double calculateArea() {
         return length* width;
    }
     public double calculate Perimeter() {
         return 2* (length + width);
    }
}
class Triangle extends Shape {

private double side1; private
    double side2;
     private double side3;
     public Triangle(double side1, double side2, double side3) {
         this.side1
```

```
                          side1;
        this.side2 side2;

    }




    }
        this.side3 side3;

    public double calculateArea() {
        double s = (side1 + side2+ side3)/2;
        return Math.sqrt(s* (s- side1) * (s- side2)* (s - side3));



    public double calculate Perimeter() {
        return side1 + side2+ side3;
    }
}
public class ShapeTest {
    public static void main(String[] args) {
        Rectangle rectangle = new Rectangle(5, 4);
        Triangle triangle = new Triangle(3, 4, 5);
        System.out.println("Rectangle Area: " + rectangle.calculateArea());
        System.out.println("Rectangle Perimeter: " + rectangle.calculate Perimeter());
        System.out.println("Triangle Area: " + triangle.calculateArea());
        System.out.println("Triangle Perimeter: " + triangle.calculate Perimeter());
    }
}
```

```
Rectangle Area: 20.0
Rectangle Perimeter: 18.0
Triangle Area: 6.0
Triangle Perimeter: 12.0
PS C:\Users\User\Desktop\Java\practice>
```

2. Write a program in Java to illustrate the **use of interface in Java**. **Code:**

```
interface Printable {

}
    void print();
```

```
class Printer implements Printable {


    public void print() {
        System.out.println("Printing...");
    }
}
public class InterfaceExample {



   }
    public static void main(String[] args) {
    Printable printer = new Printer();
    printer.print();
```

3. **Create a general class** ThreeDObject and derive the **classes Box,** Cube, Cylinder **and** Cone **from** it. **The class** ThreeDObject **has methods wholeSurfaceArea () and** volume( ). **Override these two methods in each of the derived classes to calculate the volume**

and whole surface area of each type of three-**dimensional** objects. **The dimensions of**

the **objects** are to **be** taken **from** the users **and passed** through the respective **constructors** of **each** derived **class**. Write **a main** method to test these **classes**. Code: abstract class Three DObject {

```
}
    public abstract double whole SurfaceArea();
    public abstract double volume();

class Box extends ThreeDObject {
    private double length;
    private double width;
    private double height;
    public Box(double length, double width, double height) {



    }
```

```
        this.length = length;
        this.width = width;
        this.height = height;

    public double wholeSurfaceArea() {
        return 2 * (length* width + length *height + width *height);
    }


    }
}
    public double volume() {
        return length *width* height;


class Cube extends ThreeDObject {
    private double side;
    public Cube(double side) {
    public double wholeSurfaceArea() {

    }
        return 6* side * side;

    public double volume() {
        return side* side * side;
    }
}
class Cylinder extends Three DObject {
    private double radius;
    private double height;
    public Cylinder(double radius, double height) {


    }
        this.radius
                        radius;
        this.height height;

    public double whole SurfaceArea() {

    }
    public double volume() {
        return 2* Math.PI* radius * (radius + height);
        return Math.PI* radius* radius * height;
    }
}
class Cone extends ThreeDObject {
```

```
}
     private double radius;
     private double height;
     public Cone(double radius, double height) {

    }
         this.radius radius;
         this.height = height;

     public double wholeSurfaceArea() {

    }
         double slantHeight = Math.sqrt(radius * radius + height *height);
         return Math. PI* radius* (radius + slantHeight);
      public double volume() {
         return (1.0/3.0)* Math. PI* radius* radius * height;
```

```
public class Three DObjectTest {
    public static void main(String[] args) {
        Box box = new Box(2, 3, 4);
        System.out.println("Box Whole Surface Area: " + box.wholeSurfaceArea());
        System.out.println("Box Volume: " + box.volume());
        Cube cube = new Cube(5);
        System.out.println("Cube Whole Surface Area: " + cube.wholeSurfaceArea());
        System.out.println("Cube Volume: " + cube.volume());
        Cylinder cylinder = new Cylinder(3, 6);
        System.out.println("Cylinder Whole Surface Area: " + cylinder.wholeSurfaceArea());
        System.out.println("Cylinder Volume: " + cylinder.volume());
        Cone cone = new Cone(4, 7);
        System.out.println("Cone Whole Surface Area: "+cone.whole SurfaceArea()); }
```

```
 Box Whole Surface Area: 52.0
 Box Volume: 24.0
 Cube Whole Surface Area: 150.0
 Cube Volume: 125.0
 Cylinder Whole Surface Area: 188.4955592153876
 Cylinder Volume: 169.64600329384882
 Cone Whole Surface Area: 175.92918860102842
 Cone Volume: 117.6470588235294
PS C:\Users\User\Desktop\Java\practice>
```

4. Write a program to create a class named Vehicle having protected instance variables

regnNumber, **speed, color, ownerName and a method showData () to show "This is a vehicle class".** Inherit the Vehicle **class** into **subclasses named** Bus and Car **having individual private instance variables routeNumber** in **Bus and manufacturerName** in **Car**

and both of them **having showData ()** **method showing all details** of Bus **and Car** respectively **with** content **of the** super **class's showData ()** **method**.

Code:
```
class Vehicle {
    protected String regnNumber;
    protected double speed;
    protected String color;

    protected String ownerName;
    public Vehicle(String regnNumber, double speed, String color, String owner Name) {
        this.regnNumber = regnNumber;
        this.speed speed;
        this.color color;
        this.ownerName = ownerName;
    }
    protected void showData() {
        System.out.println("This is a vehicle class");
    }
}
class Bus extends Vehicle{
    private int routeNumber;
    public Bus(String regnNumber, double speed, String color, String ownerName, int

    routeNumber) {


    }
        super(regnNumber, speed, color, owner Name);
        this.routeNumber = routeNumber;

    protected void showData() {


    }
    }
        super.showData();
        System.out.println("Route Number: " + route Number);


class Car extends Vehicle{
    private String manufacturerName;
    public Car(String regnNumber, double speed, String color, String ownerName, String
manufacturerName) {


    }
        super(regnNumber, speed, color, ownerName);
        this.manufacturerName = manufacturerName;

    protected void showData() {
        super.showData();
        System.out.println("Manufacturer Name: " + manufacturer Name);

    }
}
public class Vehicle Test {
    public static void main(String[] args) {
        Bus bus = new Bus("ABC123", 60.0, "Red", "John Doe", 101);
        bus.showData();
        Car car = new Car("XYZ456", 100.0, "Blue", "Jane Doe", "Toyota");
        car.showData();
    }
}
```

```
This is a vehicle class
Route Number: 101
This is a vehicle class
Manufacturer Name: Toyota
```

5. Create **three interfaces, each with two methods**. Inherit a new **interface from** the three, adding **a new method**. **Create a class by** implementing the **new interface** and **also** inheriting **from** a concrete **class**. **Now** write four methods, each **of which takes** one of the four interfaces **as an argument**. In **main (), create an** object **of** your **class and** pass it to **each of** the **methods**.

Code: interface Interface1 {

```
}
    void method1();
    void method2();

interface Interface2 {
    void method3();
    void method4();
}
interface Interface3 extends Interface1, Interface2 {

}
    void method5();

class MyClass implements Interface3 {
    }



    }
}
        }


        }


        }
         public void method 1() {


         public void method2() {


         public void method3() {


         public void method4() {
             System.out.println("Method 1");


             System.out.println("Method 2");


             System.out.println("Method 3");
        System.out.println("Method 4");

    public void method5() {
        System.out.println("Method 5");


public class InterfaceInheritanceTest {
    public static void main(String[] args) {
        MyClass myObj = new MyClass();
        myObj.method1();
        myObj.method2();
        myObj.method3();
        myObj.method4();
```

```
Method 1
Method 2
Method 3
Method 4
Method 5
```

6. Create an interface Department containing attributes deptName and deptHead**. It also has abstract** methods **for printing** the attributes. Create **a class** hostel containing hostel **Name**, hostel Location **and** numberofRooms. The **class contains** methods for **getting and printing** the **attributes. Then write Student class extending the Hostel class** and implementing the **Department interface**. **This class contains** attributes **studentName**, regdNo, electiveSubject **and avgMarks**. **Write suitable getData and printData methods for** this **class.** Also implement the **abstract methods of** the **Department interface**. Write **a** driver class to test **the Student class**. The **program should be menu driven containing the options**:

i) Admit new student

ii) Migrate a student

iii) Display details of a student

For the third **option a search** is to **be made on the** basis **of** the entered registration

number.

Code: interface Department {

```
}
    void printDepartment();

class Hostel {
    protected String hostelName;
    protected String hostel Location;
    protected int numberOfRooms;
    public Hostel(String hostel Name, String hostel Location, int numberOfRooms) {



    }
        this.hostel Name = hostel Name;
        this.hostelLocation= hostel Location;
        this.numberOfRooms = numberOfRooms;

    public void printHostel() {
        System.out.println("Hostel Name: " + hostelName);
        System.out.println("Hostel Location: " + hostel Location);

    }
        System.out.println("Number of Rooms: " + numberOfRooms);

}
class Student extends Hostel implements Department {
    private String studentName;
    private int regdNo;
    private String electiveSubject;
    private double avgMarks;
    public Student(String hostel Name, String hostel Location, int numberOfRooms, String
studentName, int regdNo, String elective Subject, double avgMarks) {
        super(hostelName, hostel Location, numberOfRooms);
        this.studentName = studentName;
        this.regdNo regdNo;
        this.electiveSubject = elective Subject;
        this.avgMarks = avgMarks;
    }
    public void printDepartment() {




   }
        System.out.println("Student Department Information:");
        System.out.println("Student Name: " + studentName);
        System.out.println("Registration Number: " + regdNo);
        System.out.println("Elective Subject: " + electiveSubject);
        System.out.println("Average Marks: " + avgMarks);


public class Class HierarchyTest {
    public static void main(String[] args) {


        Student student = new Student("ABC Hostel", "XYZ Location", 100, "John Doe", 12345,
"Mathematics", 85.5);
        student.printHostel();
        student.printDepartment();
    }
}
```

```
Hostel Name: ABC Hostel
Hostel Location: XYZ Location
Number of Rooms: 100
Student Department Information:
Student Name: John Doe
Registration Number: 12345
Elective Subject: Mathematics
Average Marks: 85.5
```

7. **Create an** interface **called Player**. The interface has **an abstract method** called play() **that displays a message describing** the **meaning of "play" to** the **class**. **Create classes called Child, Musician**, **and Actor that all implement** Player. **Create an** application **that** demonstrates the use **of** the **classes**(UsePlayer.java

Code: interface Player {

```
}
    void play();
```

```
class Child implements Player {
    public void play() {
        System.out.println("Child is playing with toys.");
    }
}
class Musician implements Player {
    public void play() {

    }
        System.out.println("Musician is playing an instrument.");

}
class Actor implements Player {


    }
}
    public void play() {
        System.out.println("Actor is performing in a play.");


public class PlayerTest {
    public static void main(String[] args) {
        Player child = new Child();
        Player musician = new Musician();

        Player actor = new Actor();
        child.play();
        musician.play();
        actor.play();
    }
```

```
    Child is playing with toys.
    Musician is playing an instrument.
    Actor is performing in a play.
```

8. **Create an abstract class** Accounts **with** the following **details**:

Data Members:

(a) Balance (b) accountNumber **(c)** accountHolders **Name** (**d**) address

Methods:

(a) withdrawl()- abstract

(b) deposit**()**- **abstract**
(c) display() to show the balance of the **account number**
Create a **subclass** of this **class** Savings Account and **add** the following **details**:

Data Members:
(a) rateOfInterest
Methods:
(a) calculateAount()
Code: abstract class Accounts {

```
    protected double balance;
    protected int accountNumber;
    protected String account Holders Name;
    protected String address;

    public abstract void withdrawl();
    public abstract void deposit();

    public void display() {

        System.out.println("Balance of Account Number " + accountNumber + ":
                                                                        + balance);
    }
}
class SavingsAccount extends Accounts {
    private double rateOfInterest;
    public Savings Account(double balance, int accountNumber, String accountHoldersName, String
address, double rateOfInterest) {
        this.balance = balance;
        this.accountNumber = accountNumber;
        this.accountHoldersName = accountHolders Name;
        this.address = address;
        this.rateOfInterest rateOfInterest;
    }
    public void calculate Amount() {
        balance + balance* (rateOfInterest / 100);
    }
}
public class Accounts Test {
    public static void main(String[] args) {
        Savings Account savingsAccount = new SavingsAccount(1000, 12345, "John Doe",
"123 Main St", 5.0);
        savingsAccount.deposit();
        savingsAccount.withdrawl();
        savingsAccount.calculateAmount();
        savingsAccount.display();
    }
}
```

9. Create an abstract class MotorVehicle **with** the following details:

Data Members:

(a) modelName **(b)**modelNumber **(c) modelPrice**

Methods:

(a) display() to show all the **details**

Create **a subclass of this class Carthat** inherits the **class** MotorVehicle and **add** the following **details**:

Data Members**:**

(b) **discountRate**

Methods:

(a) display() **method to display** the **Car name, model number**, **price** and **the discount rate**.

(**b**) discount**() method to compute** the discount.

Code:
```
abstract class MotorVehicle {
    protected String modelName;
    protected int modelNumber;
    protected double model Price;
    public void display() {



    }
}
        System.out.println("Model Name: " + modelName);
        System.out.println("Model Number: " + modelNumber);
        System.out.println("Model Price: " + modelPrice);


class Car extends MotorVehicle {
    private double discountRate;
    public Car(String modelName, int model Number, double model Price, double
discountRate) {
    }


    }
}
        this.modelName = modelName;
        this.model Number = modelNumber;
        this.modelPrice = modelPrice;
        this.discountRate = discountRate;

    public void display() {
        super.display();
        System.out.println("Discount Rate: " + discountRate);


 public class MotorVehicle Test {
    public static void main(String[] args) {
        Car car = new Car("Toyota", 123, 25000, 10.0);
        car.display();
    }


}
```

```
        Model Name: Toyota
        Model Number: 123
        Model Price: 25000.0
        Discount Rate: 10.0
```

10. Implement the below **Diagram**.

Here, **Asset class is an abstract class containing an abstract** method **displayDetails**() **method**. **Stock,** bond **and** Savings class inherit **the Asset class and displayDetails**() method **is** defined in **every class**.

Asset Class

Structure Fields:
`descriptor date`
`current_value`

Stock Class

Inherited Fields:

descriptor date

current_value

Stock Fields: num_shares

share_price

asset

Bond Class

Inherited Fields:

descriptor date

current_value

Bond Fields:

interest_rate

asset

Savings Class

Inherited Fields:

descriptor

date

current_value

Savings Fields:

interest_rate

asset

Code: abstract class Asset {

```
    private String descriptor;

    private String date;

    private double currentValue;

    public Asset(String descriptor, String date, double currentValue) {




    }
        this.descriptor = descriptor;

        this.date date;

        this.currentValue = currentValue;




}
    public abstract void displayDetails();
```

```
class Stock extends Asset {
    private int numShares;
    private double share Price;
    public Stock(String descriptor, String date, double currentValue, int numShares, double
sharePrice) {




    }
        super(descriptor, date, currentValue);
        this.numShares numShares;
        this.share Price = share Price;

    public void display Details() {
        System.out.println("Asset: Stock");
        System.out.println("Descriptor: " + descriptor);
        System.out.println("Date: " + date);
        System.out.println("Current Value: $" + currentValue);
        System.out.println("Number of Shares: " + numShares);
        System.out.println("Share Price: $" + share Price);
    }
}
class Bond extends Asset {
    private String interestRate;
    private double asset;
    public Bond(String descriptor, String date, double currentValue, String interestRate,
double asset) {


    }







    }
}
        super(descriptor, date, currentValue);
        this.interestRate = interestRate;
        this.asset
                          asset;

    public void display Details() {
        System.out.println("Asset: Bond");
        System.out.println("Descriptor: " + descriptor);
        System.out.println("Date: " + date);
        System.out.println("Current Value: $" + currentValue);
        System.out.println("Interest Rate: " + interestRate);
        System.out.println("Asset Value: $" + asset);


class Savings extends Asset {




   }





   }
    private String interestRate;
    public Savings (String descriptor, String date, double currentValue, String interestRate) {

        super(descriptor, date, currentValue);
        this.interestRate = interestRate;

    public void displayDetails() {
        System.out.println("Asset: Savings");
        System.out.println("Descriptor: " + descriptor);
        System.out.println("Date: " + date);
        System.out.println("Current Value: $" + currentValue);
        System.out.println("Interest Rate: " + interestRate);
```

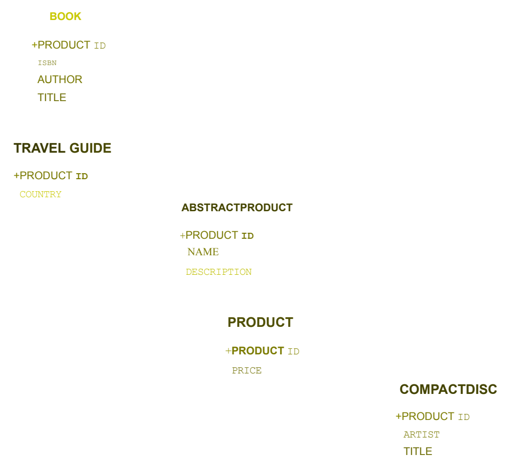
```
stock Details:
Asset:  Stock
Descriptor: Apple Inc.
Date: 2023-03-15
Current value: $12575.0
```

```
Number of Shares: 100
Share Price: $125.75

Bond Details:
Asset: Bond
Descriptor: US Treasury Bond
Date: 2022-09-01
Current Value: $10000.0
Interest Rate: 3.5%
Asset value: $9850.0

Savings Details:
Asset: Savings
Descriptor: Savings Account
Date: 2021-06-30
Current Value: $25000.0
Interest Rate: 2.75%
```

11. Implement the below **Diagram**. Here AbstractProduct is only **abstract** class.



Code: abstract class AbstractProduct {

```
  private int productId;
  private String description;



 }
  public AbstractProduct(int productId, String description) {
      this.productId = productId;
      this.description = description;
```

```
    public int getProductId() {


    public String getDescription() {
        return productId;
    }

        return description;
    }
    public abstract void showDetails();
}
class Product extends AbstractProduct {




    }



    }





    }
}
    private double price;
    public Product(int productId, String description, double price) {
        super(productId, description);
        this.price = price;

    public double getPrice() {
        return price;


    public void showDetails() {
        System.out.println("Product ID: " + getProductId());
        System.out.println("Description: " + getDescription());
        System.out.println("Price: $" + price);


class Book extends Product {
    }


    }
}


}
    private String author;
    private String title;
    public Book(int productId, String description, double price, String author, String title) {
        super(productId, description, price);
        this.author = author;
        this.title
                    title;

    public void showDetails() {
        super.showDetails();
        System.out.println("Author: " + author);
        System.out.println("Title: " + title);


class Travel Guide extends Book {
    private String location;
    public Travel Guide (int productId, String description, double price, String author, String title,
String location) {
    }
        super(productId, description, price, author, title);
        this.location = location;

    public void showDetails() {


    }
        super.showDetails();
        System.out.println("Location: " + location);
class Compact Disc extends Product {
    private String artist;
    public Compact Disc(int productId, String description, double price, String artist) {
        super(productId, description, price);

    }
        this.artist
                        artist;

    public void showDetails() {
        super.showDetails();
        System.out.println("Artist: "+ artist);
    }
}
```

```
Book Details:
Product ID: 1
Description: Fiction Novel
Price: $14.99
Author: John Doe
Title: The Lost Kingdom

Travel Guide Details:
Product ID: 2
Description: Travel Guide
Price: $19.99
Author: Jane Swith
Title: Explore Italy
Location: Rome

Compact Disc Details:
Product ID: 3
Description: Pop Album
Price: $9.99
Artist: The Melodies
```

12. Implement the **below Diagram**

Two-Wheeler **Class**

ID

Name

LicenseNumber

Vehicle Class

ID

Name

LicenseNumber

Four-Wheeler Class

ID

Name

LicenseNumber

SteeringWheel

SteeringHandle

Code:
```
class Vehicle {
    private int id;
    private String name;
    private String licenseNumber;
    public Vehicle(int id, String name, String license Number) {
        this.id = id;
        this.amset oanber license Number;
    }
}
class TwoWheeler extends Vehicle {
    private String steering Handle;
    public TwoWheeler(int id, String name, String licenseNumber, String steering Handle) {
        super(id, name, license Number);
        this.steering Handle = steering Handle;
    }
}
class FourWheeler extends Vehicle{
    private String steeringWheel;
    ublic Four Wheeler(int id, String name, String license Number, String steering Wheel) {
        super(id, name, licenseNumber);
        this.steeringWheel steering Wheel;
    }
}
```

```
Two-Wheeler:
ID: 1
Name: Bike
License Number: ABC123
Steering Handle: Handlebar

Four-Wheeler:
ID: 2
Name: Car
License Number: XYZ456
Steering Wheel: steering wheel
```

13. Write **a program to** implement the **Multiple Inheritance (Bank Interface**, Customer & **Account classes)**.

Code: interface Bank {

```
}
    void deposit(double amount);
    void withdraw(double amount);

class Customer implements Bank {
    private double balance;
    public Customer(double balance) {

    }
        this.balance = balance;

    public void deposit(double amount) {


    }
        balance += amount;
        System.out.println("Deposited: $" + amount);
    public void withdraw(double amount) {
        if (balance >= amount) {
            balance amount;
            System.out.println("Withdrawn: $" + amount);
        } else {
            System.out.println("Insufficient balance");
        }
    }
    public void displayBalance() {
        System.out.println("Current Balance: $" + balance);
    }
}
class Account implements Bank {
    private double balance;
    public Account(double balance) {

    }
        this.balance = balance;

    public void deposit(double amount) {
    balance += amount;

    }
        System.out.println("Deposited: $" + amount);

    public void withdraw(double amount) {
        if (balance >= amount) {
            balance
                        amount;
            System.out.println("Withdrawn: $" + amount);
        } else {
            System.out.println("Insufficient balance");
        }
    }



    }
    public void displayBalance() {
        System.out.println("Current Balance: $" + balance);
```

```
}
public class MultipleInheritance Bank {

    public static void main(String[] args) {
Customer customer = new Customer(1000);
        customer.deposit(500);
        customer.withdraw(200);
        customer.displayBalance();
        Account account = new Account(2000);
        account.deposit(1000);
        account.withdraw(500);
        account.displayBalance();
    }
}
```

```
Deposited: $500.0
Withdrawn: $200.0
Current Balance: $1300.0
Deposited: $1000.0
Withdrawn: $500.0
Current Balance: $2500.0
```

14. Write **a program to** implement the **Multiple** Inheritance **(**Gross **Interface**, Employee **&**

Salary classes).

Code: interface Gross {

```
}
    double calculateGrossSalary(double basicSalary, double allowances);

class Employee implements Gross {
    public double calculateGrossSalary(double basicSalary, double allowances) {
        return basicSalary + allowances;
    }
}
class Salary implements Gross {
    public double calculateGrossSalary (double basicSalary, double allowances) {
        return basicSalary + allowances;
    }
```

```
}
public class MultipleInheritanceGross {

    public static void main(String[] args) {
        Employee employee = new Employee();
        double empGross = employee.calculateGrossSalary(50000, 10000);



    }
        System.out.println("Employee Gross Salary: $" + empGross);
        Salary salary = new Salary();
        double salGross = salary.calculateGross Salary(60000, 12000);
        System.out.println("Salary Gross Salary: $" + salGross);
```

```
Employee Gross Salary: $60000.0
Salary Gross Salary: $72000.0
```

15. Program to create a interface 'Mango' and implement it in **'Summer'**.

Code: interface Mango {

```
}
    void displaySeason();

class Winter implements Mango {


    }
}
    public void displaySeason() {
```

classes 'Winter**' and**

```
        System.out.println("Winter mangoes are available from November to February.");


class Summer implements Mango {
    }
}
      public void displaySeason() {
          System.out.println("Summer mangoes are available from March to June.");


public class MangoSeasons {
    public static void main(String[] args) {
        Winter winterMango = new Winter();
        System.out.print("Winter Mangoes: ");
        winterMango.displaySeason();




    }
        Summer summerMango = new Summer();
        System.out.print("Summer Mangoes: ");

        summerMango.displaySeason();

}
```

```
Winter Mangoes: Winter mangoes are available from November to February.
Summer Mangoes: Summer mangoes are available from March to June.
```

16. Program to implement the **Multiple Inheritance (Exam Interface, Student & Result classes).** Code:

```
interface Exam {
    void display Exam();
}
class Student implements Exam {





    }
    private String name;
    private int rollNumber;
    public Student(String name, int rollNumber) {
        this.name = name;
        this.roll Number = rollNumber;
    public void display Exam() {


   }
}
System.out.println("Student Name: " + name);
        System.out.println("Roll Number: " + rollNumber);


class Result implements Exam {
    private int marks;
    public Result(int marks) {
        this.marks
                                marks;
   }


    }
}
    public void display Exam() {
        System.out.println("Marks Obtained: " + marks);


public class MultipleInheritance Exam {








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

        Student student = new Student("John", 101); Result
        result = new Result(85);
        System.out.println("Student Details:");
        student.displayExam();
        System.out.println("Exam Result:");
        result.displayExam();
```

```
Student Details:
Student Name: John
Roll Number: 101
Exam Result:
Marks Obtained: 85
```

17. Program to demonstrate use of hierarchical inheritance using interface. Code:

```
interface Shape {
    double calculateArea();
}
interface TwoDimensional Shape extends Shape {
    double calculate Perimeter();

interface Three Dimensional Shape extends Shape {
}


}
    double calculate Volume();

class Circle implements Two DimensionalShape {
    private double radius;
    public Circle(double radius) {
        this.radius = radius;
    }
    public double calculateArea() {
        return Math. PI* radius * radius;
    }
    public double calculate Perimeter() {
        return 2 * Math. PI* radius;
    }

}
class Sphere implements ThreeDimensionalShape {
    private double radius;
    public Sphere(double radius) {

    }
        this.radius
```

```
                        radius;

    public double calculateArea() {

    }
        return 4* Math. PI* radius * radius;

    public double calculate Volume() {
        return (4.0/3.0) * Math. PI* radius * radius* radius;
    }
}

}
public class HierarchicalInheritance Demo { public
        static void main(String[] args) {

    }
        Circle circle = new Circle(5);
        System.out.println("Circle Area: " + circle.calculateArea());
        System.out.println("Circle Perimeter: " + circle.calculate Perimeter());
        Sphere sphere = new Sphere(4);
System.out.println("Sphere Area: " + sphere.calculateArea());
        System.out.println("Sphere Volume: " + sphere.calculateVolume());
```

```
Circle Area: 78.53981633974483
Circle Perimeter: 31.41592653589793
Sphere Area: 201.06192982974676
Sphere Volume: 268.082573106329
```

18. Java program to Perform Payroll Using **Interface (Multiple** Inheritance**)**. **Code:**

```
interface Payable {

}
    double calculate Pay();

class Employee implements Payable {
    private String name;

    private double hourlyRate;
    private int hoursWorked;
    public Employee (String name, double hourly Rate, int hoursWorked) {



    }
        this.name = name;
        this.hourly Rate = hourly Rate;
        this.hoursWorked
                                hoursWorked;

    public double calculate Pay() {

    }
        return hourlyRate* hoursWorked;

    public String getName() {
        return name;
    }
}
class Contractor implements Payable {
    private String name;
    private double rate;
    private int hoursWorked;
    public Contractor(String name, double rate, int hours Worked) {



    }
        this.name = name;
        this.rate rate;
        this.hoursWorked hoursWorked;
    public double calculate Pay() {
        return rate * hoursWorked;
    }
    public String getName() {
        return name;
    }
}
public class Payroll {
    public static void main(String[] args) {
            Employee employee = new Employee("John", 25.0, 40);
            Contractor contractor = new Contractor("Jane", 30.0, 30);









}
    }
        displayPay(employee);
        displayPay(contractor);

    public static void display Pay(Payable payable) {



    }
System.out.println("Name: " + payable.getName());
        System.out.println("Pay: $" + payable.calculate Pay());
        System.out.println();
```

```
Name: John
Pay: $1000.0

Name: Jane
Pay: $900.0
```

```
    private int marks1, marks2;
    public Student(String name, int roll_no, int marks1, int marks2) {
        this.name = name;
        this.roll_no = roll_no;
```

19. Implement the following **diagram**.

Interface: Exam

Percent cal()

Class: Student

name, roll_no, marks1,
marks2,
show()

Class: Result

per display()

Code:
```
interface Exam {


}
    double percent_calc();


class Student implements Exam {

    private String name;

    private int roll_no;



    }
        this.marks1 = marks1;
        this.marks2 = marks2;


    public double percent_calc(){
        int total_marks marks1 + marks2;


   }
        return (double) total_marks/200* 100;}
    public void show() {
```

```
class Result extends Student {

    }
    private double percentage;

    public Result(String name, int roll_no, int marks1, int marks2) {

        super(name, roll_no, marks1, marks2);

        this.percentage = super.percent_calc();


    public void display() {

        super.show();

        System.out.println("Percentage: " + percentage + "%");

    }

}



}
     System.out.println("Name: " + name);
     System.out.println("Roll No: " + roll_no);
     System.out.println("Marks 1: " + marks1);
     System.out.println("Marks 2: " + marks2);
```

```
Name:  John Doe

Roll No: 1001

Marks 1:  85

Marks 2:  92

Percentage:  88.5%
```

Week: 7

1. **Write a Java program** to **show** the **use of all keywords for exception handling**

Code: public class ExceptionHandling Keywords Demo {

```
    public static void main(String[] args) {
        try {
            int result = 10/0;
            int[] arr = new int[5];

            arr[10] = 50;
        } catch (ArithmeticException ae) {
            System.out.println("Arithmetic Exception occurred.");
        } catch (ArrayIndexOutOfBoundsException aioobe) {
            System.out.println("Array Index Out Of Bounds Exception occurred.");
        } finally {
            System.out.println("Finally block executed.");
        }
    }
}
```

```
Arithmetic Exception occurred.
Finally block executed.
```

2. Write a Java program using try and catch to generate **NegativeArrayIndex** Exception and Arithmetic Exception.

Code: public class NegativeArrayIndexDemo {

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

        try {
            int[] arr = new int[5];
            arr[-1] = 10;
            int result = 10/0;
        } catch (NegativeArraySize Exception nae) {
            System.out.println("Negative Array Index Exception occurred.");
        } catch (ArithmeticException ae) {

        }
            System.out.println("Arithmetic Exception occurred.");


}
```

3. Define **an exception called "NoMatchFoundException" that** is **thrown when a string is** not **equal to** "University". Write **a program that uses this exception**.

```
Code: class NoMatch FoundException extends Exception {


    }
 }
     public NoMatch FoundException(String message) {
         super(message);


 public class NoMatch Found Demo {

     public static void main(String[] args) {
         try {
             String inputString = "College";
             if (!inputString.equals("University")) {

             }
                 throw new NoMatch FoundException("Input string does not match 'University'");

         } catch (NoMatch FoundException e) {





}
    }
        }
             System.out.println(e.getMessage());
```

```
Input string does not match 'University'
```

4. Write a class that keeps a running total of all characters passed to it (one **at a time)**

and throws anexception if it **is passed a non-alphabetic character**.

Code: class NonAlphabeticCharacterException extends Exception {

```
    public NonAlphabeticCharacterException(String message) {
        super(message);
    }
}
 public class CharacterTotal {



    }
     private int total;
     public CharacterTotal() {
         total = 0;

     public void addCharacter(char ch) throws NonAlphabeticCharacterException {
         if (!Character.isLetter(ch)) {
               throw new NonAlphabetic CharacterException("Non-alphabetic character
   encountered: " + ch);
           }
           total++;
      }
      public int getTotal() {
          return total;

      }
   }
   public class CharacterTotal Demo {
       public static void main(String[] args) {
   Character Total characterTotal = new CharacterTotal(); try {
               characterTotal.addCharacter('a');
               characterTotal.addCharacter('b');
               characterTotal.addCharacter('1');




       }
```

```
            character Total.addCharacter('c');
        } catch (NonAlphabeticCharacterException e) {

        }
            System.out.println(e.getMessage());

        System.out.println("Total characters: " + characterTotal.getTotal());
```

5. Write a program called Factorial.java that computes factorials and catches the result **in an array** of type long for reuse**.** The long type of **variable has its own range**. **For example 20! Is as high as the** range **of long type.** So **check** the argument **passes and** "**throw an exception", if it is** too **big or** too **small**.

If x is less than 0 throw an IllegalArgumentException with a message "Value of x must be **positive".**

If x is above the **length** of the **array throw an** IllegalArgumentException **with** a **message** "Result **will overflow"**. Here **x is the** value **for which we want to find** the **factorial**.

Code: public class Factorial {

```
    public static void main(String[] args) {
        int n = Integer.parseInt(args[0]);
        try {
            long[] factorials = new long[n + 1];
            if (n < 0) {



            }
throw new IllegalArgumentException("Value of x must be positive");} else if (n>
                factorials.length-1) {
                throw new IllegalArgumentException("Result will overflow");

            factorials[0] = 1;
            for (int i = 1; i <= n; i++) {
            factorials[i] = factorials[i - 1] * i;
            }
            System.out.println("Factorial of "+n+" is: " + factorials[n]);
        } catch (NumberFormatException e) {
            System.out.println("Invalid input format. Please provide a valid integer.");
        } catch (IllegalArgumentException e) {
            System.out.println(e.getMessage());
        }
    }
```

```
   java Factorial 5
```

6. Write a class that keeps a running total of all characters passed to it (one **at a time) and throws an exception if it is passed a non-alphabetic character.**

Code:
```
class NonAlphabeticCharacterException extends Exception {
    public NonAlphabeticCharacterException(String message) {
        super(message);

   }
}
public class CharacterTotal {
    private int total;
    public CharacterTotal() {

   }
        total = 0;

    public void addCharacter(char ch) throws NonAlphabeticCharacterException {
        if (!Character.isLetter(ch)) {
            throw new NonAlphabeticCharacterException("Non-alphabetic character
encountered: " + ch);
        }
        total++;
    }
    public int getTotal() {
        return total;
    }
}
public class CharacterTotal Demo {
}
public static void main(String[] args) {
    CharacterTotal characterTotal = new CharacterTotal();
    try {
        characterTotal.addCharacter('a');
        characterTotal.addCharacter('b');
        characterTotal.addCharacter('1'); // Non-alphabetic character
        characterTotal.addCharacter('c');
    } catch (NonAlphabeticCharacterException e) {

    }
        System.out.println(e.getMessage());

    System.out.println("Total characters: " + characterTotal.getTotal());
```

```
Non-alphabetic character encountered: 1
Total characters: 2
```

}

7. Write **a** program **that outputs** the **name of** the **capital** of the country entered **at** the **command** line. The **program should throw a "NoMatchFoundException" when it fails to** print the **capital** of the **country** entered at the command line.

```
Code: class NoMatch FoundException extends Exception {


   }
}
    public NoMatch FoundException(String message) {
        super(message);


public class CountryCapital {
}
  public static void main(String[] args) {
     try {
         String country = args[0].toLowerCase();
         String capital = getCapital (country);
         System.out.println("Capital of "+country + " is " + capital);
     } catch (NoMatch FoundException e) {

     }
 }
         System.out.println(e.getMessage());


 public static String getCapital(String country) throws NoMatch FoundException {
     switch (country) {










    }
```

```
            case "india":

                return "New Delhi";
            case "usa":
                return "Washington D.C.";
            case "uk":
                return "London";
            default:
                throw new NoMatch FoundException("No capital found for country: " + country);
```

```
Capital of india is New
Delhi
```

8. Write a **program** that **takes a value at the command line for which factorial is to** be **computed**. The program must convert the **string** to its integer equivalent. There **are** three **possible** user input errors that **can** prevent the **program** from **executing normally**.

The first error is **when** the user **provides no argument** while **executing** the **program and an ArrayIndexOutOfBoundsException is raised**. You **must** write a **catch block** for this.

The **second error is NumberFormatException** that **is** raised **in case** the user **provides a** non-integer (float double**) value at the command** line.

The third **error is IllegalArgumentException**. **This** needs to **be** thrown **manually** if **the value at** the command line **is** 0.

Code: public class Factorial Calculator {

```
    public static void main(String[] args) {
        try {
            if (args.length == 0) {

            }
                throw new ArrayIndexOutOfBoundsException("No argument provided.");

            int num = Integer.parseInt(args[0]);
            if (num <= 0) {

than 0.");
            }
                throw new IllegalArgumentException("Value must be a positive integer greater


            long factorial = calculateFactorial(num);
            System.out.println("Factorial of "+num + " is: " + factorial);
        } catch (ArrayIndexOutOfBoundsException e) {
            System.out.println(e.getMessage());
        } catch (NumberFormatException e) {
            System.out.println("Invalid input format. Please provide a valid integer.");
        } catch (IllegalArgumentException e) {

        }
    }
            System.out.println(e.getMessage());


    public static long calculate Factorial (int n) {
        long factorial = 1;
        for (int i = 1; i <= n; i++) {
            factorial *= i;
        }
        return factorial;
    }
```

```
Factorial of 5 is: 120
```

9. Create a user-defined exception named CheckArgument to **check** the **number** of **arguments passed** through the **command** line**. If the** number **of argument** is less **than 5**, **throw** the CheckArgumentexception, else print the addition **of all** the five numbers. Code: class CheckArgumentException extends Exception {

```
    }
}
    public CheckArgumentException(String message) {
        super(message);


public class ArgumentChecker {
    public static void main(String[] args) {
        try {
            if (args.length < 5) {
                throw new CheckArgumentException("Number of arguments must be at least 5.");
}
  }
            }
            int sum = 0;
            for (String arg: args) {

            }
                sum += Integer.parseInt(arg);


            System.out.println("Sum of all arguments: " + sum);
        } catch (CheckArgumentException e) {
            System.out.println(e.getMessage());
        } catch (NumberFormatException e) {

        }
            System.out.println("Invalid input format. Please provide valid integers.");
```

```
Sum of all arguments: 15
```

10. Consider a Student **examination database system that** prints the **mark** sheet **of students.** Input **the following from** the **command line**.

(a) Student's **Name**

(b) Marks in **six subjects**

These marks should be between 0 to 50. If the marks are not in the specified range, raise **a RangeException**, **else find the** total **marks and** prints the percentage of the students.

Code: class Range Exception extends Exception { public RangeException(String message)

```
{
        super(message);
```

```
    }
}
public class MarkSheet {
    public static void main(String[] args) {
        try {
            if (args.length != 7) {

            }
                throw new IllegalArgumentException("Invalid number of arguments. Expected 7.");

            String name = args[0];
            int[] marks = new int[6];
            for (int i = 1; i < args.length; i++) {
                marks[i - 1] = Integer.parseInt(args[i]);
                if (marks[i - 1] < 0  || marks[i - 1] > 50) {
                    throw new RangeException("Marks should be between 0 to 50.");
                }
            }
            int totalMarks = 0;
            for (int mark marks) {

            totalMarks += mark;
            }
            double percentage = (double) totalMarks / 300 * 100;
            System.out.println("Student Name: " + name);
            System.out.println("Total Marks: " + totalMarks);
            System.out.println("Percentage: " + percentage + "%");
        } catch (IllegalArgumentException e) {
            System.out.println(e.getMessage());
        } catch (NumberFormatException e) {
    System.out.println("Invalid input format. Please provide valid integers for marks."); } catch
        (Range Exception e) {
            System.out.println(e.getMessage());

}
        }
```

13

```
        }
```

```
Student Name: John
```

Total Marks: 260

Percentage: 86.66666666666667%

11. Write a java program to create an custom Exception that **would** handle **at least 2 kind of Arithmetic Exceptions while calculating a** given **equation (e.g. X+Y***(P/Q)**Z-I)** Code: **// 11.** Write **a java** program to create a custom Exception **that would handle at least 2** kinds of Arithmetic Exceptions while **calculating** a given **equation** (e.g. **X+Y***(**P**/Q)Z-**I**)

Code:
```
class CustomArithmeticException extends Exception {
    public CustomArithmeticException(String message) {
        super(message);
   }



public class EquationCalculator {
    public static void main(String[] args) {
        try {
            int x = Integer.parseInt(args[0]);
            int y = Integer.parseInt(args[1]);
            int p = Integer.parseInt(args[2]);
            int q = Integer.parseInt(args[3]);
            int z = Integer.parseInt(args[4]);
            int i = Integer.parseInt(args[5]);

double result = calculateEquation(x, y, p, q, z, i);
            System.out.println("Result of the equation: " + result);
        } catch (NumberFormatException e) {
            System.out.println("Invalid input format. Please provide valid integers.");
        } catch (CustomArithmeticException e) {
            System.out.println(e.getMessage());
        }
    }


    public static double calculateEquation(int x, int y, int p, int q, int z, int i) throws
CustomArithmeticException {
        try {
            return x + y * (p/q) * z–i;
        } catch (ArithmeticException ae) {
```

```
 java Equation Calculator 10  5 20 0 3 2
public TooCold(String message) {
       throw new CustomArithmeticException("Arithmetic Exception occurred while
calculating the equation.");



}
  }
      }
```

12. Create two user-defined exceptions named "TooHot" and "TooCold" to check the

temperature **(in** Celsius**)** given by the user **passed through** the **command** line is too

hot or too **cold**.

If temperature > 35, throw exception "TooHot**"**.

If temperature <5, **throw exception** "TooCold**"**.

Otherwise, print "**Normal" and convert it to Farenheit**.

Code: class Too Hot extends Exception {

```
 public TooHot(String message) {
      super(message);
  }
}
class TooCold extends Exception {

  }
}
```

```
         super(message);


public class TemperatureCheck {
    public static void main(String[] args) {try {
            int temperature = Integer.parseInt(args[0]);
            if (temperature > 35) {

            }
                throw new TooHot("Temperature is too hot!");

            else if (temperature < 5) {

            }
                throw new TooCold("Temperature is too cold!");

            else {




            }
                System.out.println("Normal");

                double fahrenheit = (temperature * 9.0/5.0) + 32.0;
                System.out.println("Temperature in Fahrenheit: " + fahrenheit);

        } catch (TooHot e) {
    System.out.println(e.getMessage()); }
        catch (TooCold e) {
            System.out.println(e.getMessage());
        } catch (NumberFormatException e) {

        }
            System.out.println("Please provide a valid integer temperature as input.");


        }
          catch (ArrayIndexOutOfBoundsException e) {

            System.out.println("Please provide the temperature as a command line argument.");


}
}
```

```
Normal
Temperature in Fahrenheit: 77.0
```

13. Consider an **Employee** recruitment **system that** prints the **candidate name** based on the **age criteria. The name and age** of the **candidate are taken as Input.Create two** user-defined **exceptions named** "TooOlder" **and** "TooYounger"

If age>45, **throw** exception **"TooOlder"**.

If age<20, throw exception "TooYounger".

Otherwise, print "Eligible" and print the **name of** the **candidate**.

Code:
```
class TooOlder extends Exception {
    public TooOlder(String message) {
        super(message);
    }
}
class Too Younger extends Exception {
    public TooYounger(String message) {
        super(message);
    }
}
```

```
}
 public class Employee Recruitment {
     public static void main(String[] args) {
         try {

             String name = args[0];
             int age = Integer.parseInt(args[1]);
             if (age > 45) {
                 throw new TooOlder("Candidate is too old for recruitment!");
             } else if (age< 20) {
     throw new Too Younger("Candidate is too young for recruitment!"); } else {


             }
                 System.out.println("Eligible");
                 System.out.println("Candidate Name: " + name);

         } catch (TooOlder e) {
             System.out.println(e.getMessage());
         } catch (TooYounger e) {
             System.out.println(e.getMessage());
         } catch (NumberFormatException e) {
            System.out.println("Please provide a valid integer age as input.");
        } catch (ArrayIndexOutOfBoundsException e) {

        }
            System.out.println("Please provide name and age as command line arguments.");
```

```
Eligible

Candidate Name: John
```

14. Consider a "Binary to Decimal" Number conversion system which only accepts binary number **as Input**. **If** user provides a **decimal** number **a custom Exception** "Wrong **NumberFormat" exception** will **be** thrown. Otherwise**,** it will convert into **decimal and** print into the **screen**.

Code**:** class Wrong NumberFormat extends Exception {

```
    public Wrong NumberFormat(String message) {
        super(message);
    }
}


public class BinaryToDecimal Converter {
    public static void main(String[] args) {
        try {
            String binary Number = args[0];
            if (!binaryNumber.matches("[01]+")) {

            }
                throw new Wrong NumberFormat("Input is not a binary number!");

            int decimal Number = Integer.parseInt(binaryNumber, 2);
            System.out.println("Decimal equivalent: " + decimalNumber);
        } catch (Wrong NumberFormat e) {
            System.out.println(e.getMessage());
        } catch (NumberFormatException e) {
    System.out.println("Please provide a valid binary number as input."); }
        catch (ArrayIndexOutOfBoundsException e) {
            System.out.println("Please provide the binary number as a command line
argument.");
    } }
```

```
Decimal equivalent: 10
```

15. Write **a Java Program that** Implement the **Nested** Try **Statements**. **Code:**

```
public class NestedTryExample {
    public static void main(String[] args) {
        try {
            System.out.println("Outer try block starts");
            int result = 10/0; // This will throw ArithmeticException
            try {
                System.out.println("Inner try block starts");
                String str = null;
                System.out.println(str.length());

                System.out.println("Inner try block ends");

            } catch (NullPointerException e) {


            }
                System.out.println("Caught NullPointerException: " + e.getMessage());


            System.out.println("Outer try block ends");

        } catch (ArithmeticException e) {


        }
            System.out.println("Caught ArithmeticException: " +  e.getMessage());
```

```
Outer try block starts
Caught ArithmeticException: / by zero
Outer try block ends
```

Java Program Which **has a Class Called Less BalanceException** Which **returns** the **Statement that Says With Draw Amount(_Rs) is** Not **Valid**

☐☐Java **Program** that has **a Class** Which Creates **2 Accounts**, Both **Account** Deposit Money and One Account Tries to With **Draw** more Money **Which** Generates **a LessBalanceException Take Appropriate Action for** the **Same**.

Code: class Less Balance Exception extends Exception {

```
    public LessBalanceException(String message) {
    }
}
        super(message);


 class Account {
     private double balance;
     private static final double MIN_BALANCE = 500; // Minimum balance required
     public Account() {

    }
         balance = MIN_BALANCE; // Initialize balance with minimum balance

     public void deposit(double amount) {



    }







    }
         balance += amount;
         System.out.println("Amount deposited: " + amount);
         System.out.println("Current balance: " + balance);

     public void withdraw(double amount) throws Less BalanceException {
         if (balance - amount < MIN_BALANCE) {

        }
             throw new LessBalanceException("Withdrawal amount exceeds available balance!");

         balance amount;
         System.out.println("Amount withdrawn: " + amount);
         System.out.println("Current balance: " + balance);



 public class BankAccountManagement {
```

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

  }
            Account account = new Account();
            account.deposit(1000);
            account.withdraw(700);
        } catch (LessBalanceException e) {
            System.out.println(e.getMessage());
        }
```

```
                Amount deposited:  1000.0

                Current balance:  1500.0

                Amount withdrawn:  700.0

                Current balance:  800.0
```

17. Consider a Library Management System, where **a** user **wants to find a** book. **If** the **book is present in Library (Hint**: **Use** predefined **array),** then it **will** print the **book.** Otherwise **it will throw** an **exception "BookNotFoundException"**.

Code: class BookNotFoundException extends Exception {

```
    public BookNotFoundException(String message) {
        super(message);
    }
}
public class Library ManagementSystem {
    private static final String[] books = {"Book1", "Book2", "Book3", "Book4", "Book5"};
    public static void findBook(String book Title) throws Book NotFoundException {
        boolean found = false;
        for (String book: books) {

            }
        }
            if (book.equalsIgnoreCase(bookTitle)) {
                System.out.println("Book found: " + book);
                found = true;
                break;

        if (!found) {
            throw new BookNotFoundException("Book not found in the library!");
        }

    }
    public static void main(String[] args) {
        try {
            findBook("Book3");
            findBook("Book6");
        } catch (BookNotFoundException e) {
            System.out.println(e.getMessage());
        }

}
```

```
Book found: Book3

Book not found in the library!
```

18. Consider a Quiz Management System, where **a user** needs **to answer 5 questions.** If any **of the** answer is wrong, **throw an** exception **"NotCorrectException". If** the **answer is correct give a message "**good! The **answer** is **correct"**.

Code: class NotCorrectException extends Exception {

```
    public NotCorrectException(String message)
    {
        super(message);
    }
}
public class QuizManagementSystem {
    public static void checkAnswer(String userAnswer, String correctAnswer, int
question Number) throws NotCorrectException {


"!");
```

```
    }
        if (!userAnswer.equalsIgnoreCase(correctAnswer)) {


        }
            throw new NotCorrectException("Incorrect answer for question " + question Number +


        System.out.println("Good! The answer to question " + question Number + " is correct.");
    public static void main(String[] args) {
        try {
            String[] questions = {"Q1: What is the capital of France?", "Q2: What is the capital of
Japan?",
                                "Q3: What is the largest ocean?", "Q4: Who wrote Romeo and Juliet?", "Q5:
                                What is the chemical symbol for water?"};

            String[] correctAnswers = {"Paris", "Tokyo", "Pacific", "William Shakespeare", "H2O"};
            String[] userAnswers = {"Paris", "Tokyo", "Atlantic", "William Shakespeare", "H2O"}; for (int i = 0;
            i < questions.length; i++) {


            }
                checkAnswer(userAnswers[i], correctAnswers[i], i + 1);


        } catch (NotCorrectException e) {

        }
    }
            System.out.println(e.getMessage());


}
    public InvalidUsernameException(String message) {
        super(message);
    }
}
```

```
Good! The answer to question 1 is correct.
Good! The answer to question 2 is correct.
Incorrect answer for question 3!
```

19. Write **a program to** raise a user defined exception if username is less **than** 6 **characters and password** does **not match**.

Code: class InvalidsernameException extends Exception {

```
 class Password MismatchException extends Exception {
     public Password MismatchException(String message) {
         super(message);
    }
 }
 public class Authentication System {
     public static void authenticate(String username, String password, String confirm Password) throws
 InvalidUsernameException, Password MismatchException {

         if (username.length() <6) {

 long!");
        }
             throw new Invalid UsernameException("Username must be at least 6 characters


         if (!password.equals(confirm Password)) {
             throw new PasswordMismatchException("Passwords do not match!");
         }
         System.out.println("Authentication successful!");
    }
    public static void main(String[] args) {

         try {
             String username = "user123";
             String password = "password123";
             String confirm Password = "password123"; // Correct password confirmation
             authenticate(username, password, confirm Password);
         } catch (InvalidUsernameException | Password MismatchException e) {
             System.out.println(e.getMessage());


 }
    }
        }
```

```
Authentication successful!
```

20. Write **a program to accept a password** from the user **and** throw '**Authentication** Failure' exception if the password is incorrect.

Code:
```
class Authentication FailureException extends Exception {
    public Authentication FailureException(String
    message) {

   }
}
        super(message);


public class PasswordAuthentication {
    public static void authenticate Password (String entered Password, String correctPassword) throws
Authentication FailureException {
        if (!enteredPassword.equals(correctPassword)) {
            throw new Authentication FailureException("Authentication failed! Incorrect
password.");
        }


    }
        System.out.println("Authentication successful!");

    public static void main(String[] args) {
        try {
            String correctPassword = "password123";
            String entered Password = "password123"; // Correct password
            authenticatePassword(entered Password, correctPassword);
        } catch (Authentication FailureException e) {
            System.out.println(e.getMessage());
        }
```

```
Authentication successful!
```

21. Write a **program** to input name **and age of a** person and **throw a user**-defined **exception, if**

the entered **age** is negative.

Code: class NegativeAgeException extends Exception {
```
    public NegativeAgeException(String message) {
        super(message);
    }
}
public class PersonInfo {
    public static void validateAge(int age) throws NegativeAgeException {
        if (age < 0) {

        }
            throw new NegativeAgeException("Age cannot be negative!");

        System.out.println("Name and age input successful!");
    }
    public static void main(String[] args) {
        try {
String name = "John"; // Assume name is predefined int age =
            -25; // Negative age
            validateAge(age);
        } catch (NegativeAgeException e) {
            System.out.println(e.getMessage());
        }


}
    }
```

```
            Age cannot be negative!
```

22. Write **a** program to throw user defined exception if the given number is not **positive**.

Code: class Non PositiveNumberException extends Exception {
```
    public NonPositiveNumberException(String
    message) {
        super(message);
    }
}
public class Positive NumberChecker {

{
    public static void check PositiveNumber(int number) throws NonPositiveNumberException
```

```
   }
      if (number <<= 0) {

      }
           throw new NonPositiveNumberException("Number must be positive!");

      System.out.println("Number input successful!");

   public static void main(String[] args) {
      try {
          int number = -10; // Non-positive number check
          Positive Number(number);
      } catch (NonPositiveNumberException e) {
          System.out.println(e.getMessage());
      }
  }
```

```
   Number must be positive!
```

23. Write **a program** to throw **a user**-defined **exception "String** Mismatch **Exception", if two strings are** not equal **(**ignore **the case)**.

Code: class String MismatchException extends Exception {

```
   }
}
    public StringMismatchException(String message) {
        super(message);


public class StringComparator {

{
    public static void compareStrings (String str1, String str2) throws String MismatchException


        if (!str1.equalsIgnoreCase(str2)) {
   }
          throw new String MismatchException("Strings do not match!");
       }
       System.out.println("Strings match!");
   }
   public static void main(String[] args) {
       try {
           String str1= "Hello";
           String str2= "hello";
           compareStrings(str1, str2);
       } catch (String MismatchException e) {
       System.out.println(e.getMessage());
       }
}
```

```
Strings do not match!
```

24. Design **a stack class**. Provide your **own stack exceptions namely push exception and pop exception**, **which throw exceptions when the stack is** full **and when the stack is empty respectively**. **Show the usage of these exceptions** in **handling a stack object in** the main.

Code:
```
class Push Exception extends Exception {
    public PushException(String message) {
        super(message);
    }
}
class PopException extends Exception {
    public PopException(String message) {
        super(message);
    }
```

```
}
class MyStack {
    private int[] stackArray;
    private int top;

    private int maxSize;
    public MyStack(int size) {
        maxSize = size;


    }
        stackArray = new int[maxSize];
        top = -1; // Empty stack initially

    public void push(int element) throws Push Exception {
        if (top == maxSize - 1) {
            throw new Push Exception("Stack overflow! Cannot push element onto full stack.");

        stackArray[++top] = element;
        }

    }
    public int pop() throws PopException {
        if (top == -1) {
            throw new PopException("Stack underflow! Cannot pop element from empty stack.");
        }
        return stackArray[top--];
    }
    public boolean isEmpty() {
        return (top == -1);
    }
    public boolean isFull() {

    }
}
        return (top == maxSize - 1);


public class StackDemo {
    public  static  void  main(String[]  args)  {
    MyStack stack = new MyStack(5); try {
            for (int i = 1; i <= 5; i++) {
        }
            stack.push(i);

        stack.push(6);
    } catch (PushException e) {
    }
        System.out.println(e.getMessage());

    try {
        while (!stack.isEmpty()) {

        }
            System.out.println("Popped: "+ stack.pop());

        stack.pop();
    } catch (PopException e) {

    }
}
        System.out.println(e.getMessage());
```

```
Stack overflow! Cannot push element onto full stack. Popped: 5
 Popped: 4
 Popped: 3
 Popped: 2
 Popped: 1
 Stack underflow! Cannot pop element from empty stack.
```

25. Write **an application that displays a series of at least** five **student** ID numbers **(that you have** stored **in an array) and asks the user** to enter **a numeric test score for** the **student. Create a ScoreException class, and throw a ScoreException for** the **class if the user does not enter a valid score (zero to 100)**. **Catch the ScoreException and then display an appropriate message**. **In addition,** store **a 0 for** the **student's score. At the** end **of** the **application**, **display all** the **student** IDs **and** scores.

Code: class Score Exception extends Exception {

```
  public ScoreException(String message) {
      super(message);
  }
```

```
}
public class StudentScores {
    public static void main(String[] args) {
        int[] studentIDs = {101, 102, 103, 104, 105};
        int[] scores = new int[studentIDs.length];

        java.util.Scanner scanner = new java.util.Scanner(System.in);
        for (int i = 0; i < studentIDs.length; i++) {



100.");
            System.out.print("Enter test score for student " + studenti Ds[i]+": ");
            try {
                int score = scanner.nextInt();
                if (score < 0  || score > 100) {

                }
                    throw new ScoreException("Invalid test score! Score must be between 0 and

                scores[i]= score; // Store valid score
            } catch (ScoreException e)

                    System.out.println(e.getMessage());

                    scores[i] = 0;

            System.out.println("\nStudent
                                                IDs and Test
            Scores:"); for (int i = 0; i < studentIDs.length; i++) {
            System.out.println("Student ID: " + studentIDs[i] + ", Test Score: " + scores[i]);
}
scanner.close();
```

```
Enter test score for student 101: 90
Enter test score for student 102: 105
Invalid test score! Score must be between 0 and 100.
Enter test score for student 103: -5
Invalid test score! Score must be between 0 and 100.
Entor test score for student 104: 80
```

```
Enter test score for student 105: 95

Student IDs and Test Scores:
Student ID: 101, Test Score: 90
Student ID: 102, Test Score: 0 Student ID: 103,
Test Score: 0
Student ID: 104, Test Score: 80 Student ID: 105, Test
Score: 95
```

Week: 8

1. Write a Java program for calculating Factorial. Number should be taken through user **input (Using Scanner,** BufferedReader both).

Code: import java.util.Scanner;

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





    }
        Scanner scanner = new Scanner(System.in);
        System.out.print("Enter a number to calculate its factorial: ");
        int number = scanner.nextInt();
        int factorial = calculate Factorial (number);
        System.out.println("Factorial of "+number+ " is: " + factorial);
        scanner.close();

    private static int calculateFactorial (int n) {
        if (n == 0)
            return 1;
        else
            return n * calculate Factorial(n - 1);
    }
```

```
Enter a number to calculate its factorial: 8
Factorial of 8 is: 40320
```

2. Design **a palindrome class that will input a string from console and check whether** the **string is palindrome** or not.

Code: import java.util.Scanner;

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







    }
        Scanner scanner = new Scanner(System.in);
        System.out.print("Enter a string to check if it's a palindrome: ");
        String input = scanner.nextLine();
        if (isPalindrome(input))
            System.out.println(input + " is a palindrome.");
        else
            System.out.println(input + " is not a palindrome.");
        scanner.close();

  private static boolean is Palindrome (String str) {
        StringBuilder reversed = new StringBuilder(str).reverse();
        return str.equals(reversed.toString());
    }
}
```

```
Enter a string to check if it's a palindrome: radar
radar is a palindrome.
```

3. Write **a Java program** to merge **two strings**.

Code: import java.util.Scanner;

```
public class String Merger {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.print("Enter the first string: "); String first
        scanner.nextLine();
        System.out.print("Enter the second string: ");

        String second = scanner.nextLine();


    }
        String merged = mergeStrings (first, second);
        System.out.println("Merged string: " + merged);
        scanner.close();
    private static String mergeStrings (String first, String second) {
        return first + second;
    }
}
```

4. Write a Java program for reverse a string. (String will be taken as user input through console).

Code: import java.util.Scanner;

```
    public class String Reverser {





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





        }
            Scanner scanner = new Scanner(System.in);

            System.out.print("Enter a string to reverse: ");
            String input = scanner.nextLine();
            String reversed = reverseString(input);
            System.out.println("Reversed string: " + reversed);
            scanner.close();

        private static String reverseString(String str) {

        }
            return new StringBuilder(str).reverse().toString();
```

```
Enter a string to reverse: UEM
Reversed string: MEU
```

5. **Write a Java Program** to **Concatenate Two Strings**.

Code: import java.util.Scanner;

```
public class StringConcatenation {

    }

}
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.print("Enter the first string: "); String
        first scanner.nextLine();
        System.out.print("Enter the second string: ");
        String second = scanner.nextLine();
        String concatenated = first.concat(second);
        System.out.println("Concatenated string: " + concatenated);
        scanner.close();
```

```
Enter the first string: UEM
Enter the second string: K
Concatenated string: UEMK
```

6. Write a Java Program to **check if a** Given **String is getChar from Specific Index**.

Code: import java.util.Scanner;

```
public class CharAtIndexChecker
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);

        System.out.print("Enter a string: ");
        String str = scanner.nextLine();

    }
  System.out.print("Enter an index: "); int
        index = scanner.nextInt();
        char character = getCharAtIndex(str, index);
        if (character != '\0')
            System.out.println("Character at index " + index + " is: " + character);
        else
            System.out.println("Invalid index.");
        scanner.close();

    private static char getCharAtIndex(String str, int index) {
        if (index >= 0 && index < str.length())
            return str.charAt(index);
        else
            return '\0';
    }
}
```

```
Enter a string: UEMK
Enter an index: 2
Character at index 2 is: M
```

7. Write a Java Program to Find the Length of the String.

Code:
```
import java.util.Scanner;
public class String Length Finder {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.print("Enter a string: ");

    }
```

```
        String str scanner.nextLine();
        int length = findString Length(str);
        System.out.println("Length of the string is: " + length);
        scanner.close();


    private static int findString Length(String str) {
        return str.length();
    }
}
 Enter a string: UEMK
 Length of the string is: 4
```

8. Write **a Java Program to** Find **All Possible Subsets** of given Length in **String**.

```
Code: import java.util.ArrayList;
import java.util.List;
import java.util.Scanner;
public class SubsetsOfGivenLength {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.print("Enter a string: ");
        String str scanner.nextLine();
        System.out.print("Enter the length of subsets: ");
        int length = scanner.nextInt();
  List<String> subsets = findAllSubsetsOfLength(str, length);
        System.out.println("All subsets of length " + length + " are:");
        for (String subset: subsets) {
            System.out.println(subset);
        }









}
    }
        scanner.close();
  private static List<String> findAllSubsetsOfLength(String str, int length) {
      List<String> subsets = new ArrayList<>();
      for (int i = 0; i <= str.length() - length; i++) {

      }
          subsets.add(str.substring(i, i + length));

      return subsets;
```

```
Enter a string: UEMK
Enter the length of subsets: 2 All
subsets of length 2 are:
UE
EM
MK
```

9. Write **a Java Program** to Remove the **White Spaces from a** String.

Code: import java.util.Scanner;

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






  }
      Scanner scanner = new Scanner(System.in);
      System.out.print("Enter a string with white spaces: ");
      String str scanner.nextLine();
      String stringWithoutSpaces = removeWhiteSpace(str);
      System.out.println("String without white spaces: " + stringWithoutSpaces);
      scanner.close();

    private static String removeWhiteSpace (String str) {
      return str.replaceAll("\\s", "");
  }
}
 Enter a string with white spaces: uem k
  String without white spaces: uemk
```

10. Write **a Java Program** to **Compare two Strings**.

Code: import java.util.Scanner;

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

    }
        Scanner scanner = new Scanner(System.in);
        System.out.print("Enter the first string: "); String
        first scanner.nextLine();
 System.out.print("Enter the second string: "); String
        second = scanner.nextLine();

        boolean isEqual compareStrings(first, second); if
        (isEqual)
            System.out.println("Both strings are equal.");
        else
            System.out.println("Strings are not equal.");
        scanner.close();

}
    private static boolean compareStrings (String first, String second) {

    }
        return first.equals(second);
```

```
Enter the first string: UEM
Enter the second string: K
Strings are not equal.
```

11. Write **a Java Program to Compare Performance of Two Strings**.

Code: public class String PerformanceComparator {

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

```
}
    String string1 = "Hello";
    String string2= "World";
    long startTimeConcat1 = System.nanoTime();
    for (int i = 0; i < 100000; i++) {

    }
        String result = string1 + string2;

    long endTimeConcat1 =
    System.nanoTime();
    long durationConcat1 = endTimeConcat1 - startTimeConcat1;

    long startTime Builder1 = System.nanoTime();
    for (int i = 0; i < 100000; i++) {



    }
StringBuilder builder = new StringBuilder(string1);
        builder.append(string2);
        String result = builder.toString();

    long endTimeBuilder1 = System.nanoTime();
    long duration Builder1 = endTimeBuilder1 - startTime Builder1;
    long startTimeConcat2 = System.nanoTime();
    for (int i = 0; i < 100000; i++) {

    }
        String result = string2 + string1;

    long endTimeConcat2 = System.nanoTime();
    long durationConcat2 = endTimeConcat2 - startTimeConcat2;
    long startTimeBuilder2 = System.nanoTime();
    for (int i = 0; i < 100000; i++) {



    }
        StringBuilder builder = new StringBuilder(string2);
        builder.append(string1);
        String result = builder.toString();

    long endTimeBuilder2 = System.nanoTime();
    long duration Builder2 = endTimeBuilder2 - startTimeBuilder2;
    System.out.println("Performance comparison of string concatenation:");
```

```
        System.out.println("String1 + String2: " + durationConcat1 + "nanoseconds");
        System.out.println("StringBuilder for String1: " + duration Builder1 + "nanoseconds");
        System.out.println("String2+ String1: " + durationConcat2 + "nanoseconds");
        System.out.println("StringBuilder for String2: " + duration Builder2 + " nanoseconds");
```

```
Performance comparison of string concatenation:
String1+ String2: 16216000 nanoseconds
StringBuilder for String1: 18277900 nanoseconds
String2+ String1: 9156100 nanoseconds
StringBuilder for String2: 4513700 nanoseconds
```

12. Write a Java Program to Use **Equals Method In a String Class**.

Code: import java.util.Scanner;

```
public class Equals Method Usage
    public static void main(String[] args) {




    }


    }
}
        Scanner scanner = new Scanner(System.in);
        System.out.print("Enter the first string: "); String
        first scanner.nextLine();
        System.out.print("Enter the second string: ");
        String second = scanner.nextLine();
  boolean areEqual useEquals Method (first, second); if (areEqual)
            System.out.println("Both strings are equal.");
        else
            System.out.println("Strings are not equal.");
        scanner.close();
    private static boolean useEquals Method(String first, String second) {
        return first.equals(second);
```

```
Enter the first string: UEM
Enter the second string: Kolkata
Strings are not equal.
```

13. Write **a** Java Program to **Use** EqualsIgnoreCase Method In **a** String **Class**.

Code:
```
import java.util.Scanner;
public class EqualsIgnoreCaseMethod Usage {
    public static void main(String[] args) {
```

```
    }
        Scanner scanner = new Scanner(System.in);
        System.out.print("Enter the first string: "); String
        first scanner.nextLine();
        System.out.print("Enter the second string: ");
        String second = scanner.nextLine();
  boolean areEqualIgnoreCase = useEqualsIgnoreCaseMethod(first, second); if
        (areEqualIgnoreCase)
            System.out.println("Both strings are equal ignoring case.");
        else
            System.out.println("Strings are not equal ignoring case.");
        scanner.close();

    private static boolean useEqualsIgnoreCaseMethod(String first, String second) {
        return first.equalsIgnoreCase(second);
    }
}
```

```
Enter the first string: UEM
Enter the second string: UEm
```

```
Both strings are equal ignoring case.
```

14. Write **a Java Program to** Use **compare To Method** In **a** String **Class**.

Code: import java.util.Scanner;

```
public class CompareToMethod Usage {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.print("Enter the first string: "); String
        first scanner.nextLine();
        System.out.print("Enter the second string: ");
        String second = scanner.nextLine();
```

```
}
    }
        int comparisonResult = useCompareToMethod(first, second);
        if (comparisonResult == 0)
            System.out.println("Both strings are equal.");
        else if (comparison Result < 0)
            System.out.println("First string is lexicographically smaller than the second string.");
        else
            System.out.println("First string is lexicographically greater than the second string.");
        scanner.close();

    private static int useCompareToMethod(String first, String second) {

    }
        return first.compareTo(second);
```

```
Enter the first string: UEM
Enter the second string: UEM
Both strings are equal.
```

15. **With a Java Program to Use compareToIgnoreCase Method In a** String **Class.**

Code: import java.util.Scanner;

```
public class CompareToIgnoreCase {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.println("Enter first string:"); String
        str1 scanner.nextLine();
        System.out.println("Enter second string:");
        String str2
                        scanner.nextLine();
        int result = str1.compareToIgnoreCase(str2); if
        (result == 0) {
            System.out.println("Both strings are equal.");
        } else if (result < 0) {
            System.out.println("First string is lexicographically less than second string.");
        } else {
            System.out.println("First string is lexicographically greater than second string.");
        }
    }
}
```

```
Enter first string:
UEM
Enter second string:
Kolkata
First string is lexicographically greater than second
string.
```

16. Write a Java Program to **Replace Character** or **String**.

Code: import java.util.Scanner;

```
public class ReplaceCharacter {



  }
```

```
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.println("Enter a string:");

        String input = scanner.nextLine();
        System.out.println("Enter the character/string to replace:");
        String to Replace = scanner.nextLine();
        System.out.println("Enter the replacement character/string:");
        String replacement = scanner.nextLine();
        String replacedString = input.replace(toReplace, replacement);
        System.out.println("String after replacement:");
        System.out.println(replacedString);
```

```
Enter a string:
UEMK
Enter the character/string to
replace:
M
Enter the replacement character/string:
K
String after replacement:
UEKK
```

17. Write **a Java Program to Search** Last **Occurance of a Substring** Inside **a Substring**.

Code: import java.util.Scanner;

```
public class LastOccurrence{
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.println("Enter a string:");
        String input = scanner.nextLine();
        System.out.println("Enter the substring to search for:");
        String substring = scanner.nextLine();
        int lastIndex = input.lastIndexOf(substring);
        if (lastIndex != -1) {
            System.out.println("Last occurrence of substring is at index: " + lastIndex);
        } else {
            System.out.println("Substring not found in the string.");
        }
    }
}
```

```
Enter a string:
UEM
Enter the substring to search for:
```

```
E
Last occurrence of substring is at_index: 1
```

18. Write a Java Program to Remove a Particular Character from a String.

```
Code: import java.util.Scanner;
public class RemoveCharacter {

}
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.println("Enter a string:");
        String input = scanner.nextLine();
        System.out.println("Enter the character to remove:");
        char charToRemove = scanner.nextLine().charAt(0);
        String result = input.replaceAll(String.valueOf(charToRemove), "");

  System.out.println("String after removing "" + charTo Remove + ":");
        System.out.println(result);
```

```
Enter a string:
UEMK
Enter the character to remove:
K
String after removing 'K':
UEM
```

19. Write a Java Program to Replace a Substring Inside a String by Another One.

```
Code: import java.util.Scanner;
public class ReplaceSubstring {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.println("Enter a string:");
        String input scanner.nextLine();
        System.out.println("Enter the substring to replace:");
        String to Replace = scanner.nextLine();
        System.out.println("Enter the replacement substring:");
        String replacement scanner.nextLine();
    String replacedString = input.replace(toReplace, replacement);
        System.out.println("String after replacement:");
        System.out.println(replacedString);

  }
```

```
Enter a string:
UEMK
Enter the substring to replace:
E
Enter the replacement
substring:
K
String after replacement:
.UKMK
```

20. **Write a Java Program** to **Reverse a String**.

```
Code: import java.util.Scanner;
public class ReverseString {
    public static void main(String[] args) {

    }
        Scanner scanner = new Scanner(System.in);
        System.out.println("Enter a string:");
        String input = scanner.nextLine(); String
        reversed = reverseString(input);
        System.out.println("Reversed string:");
        System.out.println(reversed);

    public static String reverseString(String str) {
        return new
        StringBuilder(str).reverse().toString();
    }
}
```

```
Enter a string:
madam
Reversed string:
madam
```

21. Write a Java Program to **Search a** Word Inside **a String**.

Code: import java.util.Scanner;

```
public class WordSearch {

    }
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.println("Enter a string:");
        String input = scanner.nextLine();
        System.out.println("Enter the word to search for:");
        String word scanner.nextLine();
        boolean found = input.contains(word);
        if (found) {
            System.out.println("Word "" + word + ""found in the string.");
        } else {

        }
            System.out.println("Word "" + word + "" not found in the string.");
}
```

```
Enter a string:
java
Enter the word to search for:
a
Word 'a' found in the string.
```

22. Write **a Java Program** to Split **a String** into a Number of **Substrings**.

```
Code: import java.util.Scanner;
public class SplitString {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.println("Enter a string:"); String
        input scanner.nextLine();
        System.out.println("Enter the delimiter:");
        String delimiter
                                scanner.nextLine();
        String[] substrings = input.split(delimiter);
        System.out.println("Substrings:");
        for (String substring substrings) {
            System.out.println(substring);
        }
    }
}
```

```
Enter a string:
UEM, UEMK
Enter the delimiter:

Substrings:
UEM
UEMK
```

23. Write **a** Java Program to **Search a Particular** Word in **a** String.

```
import java.util.Scanner;

public class WordSearch {
    public static void main(String[] args) { Scanner
        scanner = new Scanner(System.in);
        System.out.println("Enter a string:");
        String inputString = scanner.nextLine();

        // Word to search
        System.out.println("Enter the word to search:");
        String searchWord = scanner.next();
        String] words = inputString.split("\\s+");
        boolean found = false;
        for (String word: words) {
            }
        }
            if (word.equalsIgnoreCase(searchWord)) { found =
                true; break;


        if (found) {
            System.out.println("The word "" + searchWord + "" is found in the string.");
        } else {

        }
            System.out.println("The word "" + searchWord +"" is not found in the string.");


        scanner.close();

    }
```

```
Enter a string:
The quick brown fox jump over the lazy
dog
Enter the word to search:
quick
The word 'quick' is found in the string.
```

24. Write a Java Program to Replace All Occurings of a String.

Code: import java.util.Scanner;

```
public class ReplaceOccurrences {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.println("Enter a string:"); String
        input scanner.nextLine();
        System.out.println("Enter the string to replace:"); String
        to Replace = scanner.nextLine();
        System.out.println("Enter the replacement string:");
        String replacement scanner.nextLine();

        String replacedString = input.replaceAll(toReplace, replacement);

  System.out.println("Replaced string:");
```

```
        System.out.println(replacedString);
    }
}
```

```
Enter a string:
test
Enter the string to replace:
t
Enter the replacement
string:
java
Replaced string:
javaesjava
```

25. Write **a Java Program** to **Make First Character of Each** Word in Uppercase.

Code: import java.util.Scanner;

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













    }
        Scanner scanner = new Scanner(System.in);


        System.out.println("Enter a string:");
        String input = scanner.nextLine();

        String[] words = input.split("\\s+");
        StringBuilder result = new StringBuilder();
        for (String word: words) {
        }
            if (!word.isEmpty()) {


            }
                result.append(Character.toUpperCase(word.charAt(0)))
                        .append(word.substring(1)).append(" ");


        System.out.println("String with first letter of each word in uppercase:");
        System.out.println(result.toString().trim());

    } Enter a string:
      java language
      String with first letter of each word in uppercase:
      Java Language
```

26. Write **a Java Program to Delete All Repeated Words** in **String**.

Code: import java.util.Scanner;

```
public class RemoveChar{
    public static void main(String[] args) {
  Scanner scanner = new Scanner(System.in);
        System.out.println("Enter the first string:"); String
        first scanner.nextLine();
        System.out.println("Enter the second string:");
        String second = scanner.nextLine();

  StringBuilder result = new StringBuilder(); for
        (int i = 0; i < second.length(); i++) {
            char currentChar = second.charAt(i);
            if (first.indexOf(currentChar) == -1) {
                result.append(currentChar);
            }


  System.out.println("Resultant string after removal:");
        System.out.println(result.toString());
    }
}
```

27. Write **a** Java Program to Reverse the String Using **Both** Recursion and Iteration.

Code: import java.util.Scanner;

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

    }
        Scanner scanner = new Scanner(System.in);
        System.out.println("Enter a string:");
        String input = scanner.nextLine();
        String reversed = reverseString(input);
        System.out.println("Reversed string:");
        System.out.println(reversed);

    public static String reverseString(String str) {
        return new StringBuilder(str).reverse().toString();
    }
}
```

```
Enter a string:
kolkata
Reversed string:
ataklok
```

28. Write a Java Program to **Convert a String Totally into** Upper **Case**.

Code: import java.util.Scanner;

```
public class UpperCaseConversion {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.println("Enter a string:"); String input =
        scanner.nextLine();
        String upperCase = input.toUpperCase();
        System.out.println("String in upper case:");
        System.out.println(upperCase);
    }
}
```

```
Enter a string:
```

```
kolkata
String in upper case:
KOLKATA
```

29. **Write a Java Program to** Remove **all Characters** in **Second** String **which are** Present in **First** String.

Code: import java.util.Scanner;

```
public class ReplaceCharacter {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.println("Enter a string:"); String
        input = scanner.nextLine();
        System.out.println("Enter the character/string to replace:");
        String to Replace = scanner.nextLine();
        System.out.println("Enter the replacement character/string:");
        String replacement scanner.nextLine();
  String replacedString = input.replace(toReplace, replacement);
        System.out.println("String after replacement:");
        System.out.println(replacedString);
    }
}
```

```
Enter a string:
java
Enter the character/string to replace:
a
Enter the replacement character/string:
aa
String after replacement:
jaavaa
```

30. Write **a Java Program to Find the Consecutive Occurrence of any** Vowel **in a String**.

Code: import java.util.Scanner;

```
public class VowelConsecutiveOccurrences {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.println("Enter a string:");
        String input scanner.nextLine();
        boolean hasConsecutive Vowels = checkConsecutive Vowels (input); if
        (hasConsecutive Vowels) {
            System.out.println("Consecutive occurrence of vowels found.");
        } else {
        }
            System.out.println("No consecutive occurrence of vowels found.");



        public static boolean checkConsecutive Vowels (String input) {
            for (int i = 0; i < input.length() - 1; i++) {
                char current = input.charAt(i);
                char next input.charAt(i + 1);
                if (isVowel (current) && isVowel (next)) {
                    return true;
                }
            }
            return false;
        }

        public static boolean isVowel (char c) {
        return "AEIOUaeiou".indexOf(c) != -1;
        }
    }
```

```
Enter a string:
jaavaa
Consecutive occurrence of vowels found.
```

31. Write a Java Program to Find **the** Largest & Smallest Word in **a** String.

Code: import java.util.Scanner;

```
public class LargestSmallestWord {
    public static void main(String[] args) {
  Scanner scanner = new Scanner(System.in);
        System.out.println("Enter a string:"); String
        input = scanner.nextLine();

        String[] words = input.split("\\s+");
        String smallest = words[0]; String
        largest words[0];
        for (String word: words) {
            if (word.length() < smallest.length()) {
                smallest
            }
                            word;
                if (word.length() > largest.length()) {
```

```
        }
    }
                    largest = word;
                }
            }

      System.out.println("Smallest word: " + smallest);
            System.out.println("Largest word: " + largest);
```

```
Enter a string:
java is language.
Smallest word: is
Largest word: language.
```

32. **Write a Java Program to Find First and** Last **Occurrence** of **Given Character in a String**.

```
    }
```

Code: import java.util.Scanner;

```
public class FirstLastOccurrence {
}
  public static void main(String[] args) {
      Scanner scanner = new Scanner(System.in);
      System.out.println("Enter a string:");
      String input = scanner.nextLine();
      System.out.println("Enter the character to search for:");
      char ch = scanner.next().charAt(0);
      int firstIndex = input.indexOf(ch);
      int lastIndex = input.lastIndexOf(ch);

      if (firstIndex == -1) {
          System.out.println("Character ""+ch + "" not found in the string.");
      } else {


      }
          System.out.println("First occurrence of "" + ch+" at index: " + firstIndex);
          System.out.println("Last occurrence of "" +ch + "" at index: " + lastIndex);
```

```
Enter a string:
kolkata
Enter the character to search for:
k
First occurrence of 'k' at index: 0
Last occurrence of 'k' at index: 3
```

33. Write **a Java Program to Display the Characters** in **Prime Position a** Given String.

Code: import java.util.Scanner;

```
public class Prime PositionCharacters {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.println("Enter a string:");
        String input = scanner.nextLine();
        System.out.println("Characters in prime positions:");
        for (int i = 2; i < input.length(); i++) {
            if (isPrime(i)) {
                System.out.print(input.charAt(i) + " ");
            }
        }
    }

    public static boolean is Prime(int n) {
        if (n <= 1) {

        }
            return false;

        for (int i = 2; i*  i <= n; i++) {
            if (n % i == 0) {
                return false;

        }
        return true;
    }
}
```

```
Enter a string:
kolkata
Characters in prime positions:
1 k t
```

34. Write a Java Program to Sort **String** Ignoring **Whitespaces** and **Repeating Characters** Only **Once**.

Code: import java.util.Arrays;

```
import java.util.Scanner;
public class SortStringIgnoring Spaces {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.println("Enter a string:");
        String input = scanner.nextLine();
        input = input.replaceAll("\\s", "");
  char[] chars = input. toCharArray();
        Arrays.sort(chars);

        StringBuilder result = new StringBuilder();
        result.append(chars[0]);
        for (int i = 1; i < chars.length; i++) {
            if (chars[i]!= chars[i - 1]) {
                result.append(chars[i]);
            }
        }


    }
}
        System.out.println("Sorted string ignoring whitespaces and repeating characters once:");
        System.out.println(result.toString());
```

```
Enter a string:
UEM Kolkata
Sorted string ignoring whitespaces and repeating characters
once:
EKMUaklot
```

35. Write **a Java Program to** Count Replace First Occurrence of **a** String.

Code: import java.util.Scanner;

```
public class CountReplaceFirstOccurrence {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.println("Enter the input string:");
        String input = scanner.nextLine();
        System.out.println("Enter the string to replace:");
        String to Replace = scanner.nextLine();
        System.out.println("Enter the replacement string:");

        String replacement scanner.nextLine();

        int count = 0;
        int index = input.indexOf(toReplace);
        if (index != -1) {
            count++;
              input = input.substring(0, index) + replacement + input.substring(index +
toReplace.length());




    }
        }
        System.out.println("String after replacing first occurrence:");
        System.out.println(input);
        System.out.println("Number of replacements made: " + count);
```

```
Enter the input string:
JAVA
Enter the string to replace:
AB
Enter the replacement string:
A
String after replacing first
occurrence:
JAVA
Number of replacements made: 0
```

36. **Write a Java Program to** Know the Last **Index of a Particular** Word in a **String**.

Code: import java.util.Scanner;

```
public class LastIndexOfWord {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.println("Enter a string:");
        String input scanner.nextLine();
        System.out.println("Enter the word to search for:");
        String word
                              scanner.nextLine();
        int lastIndex = input.lastIndexOf(word);
        if (lastIndex != -1) {
            System.out.println("Last index of "" + word + "" in the string: " + lastIndex);
        } else {

        }
            System.out.println("Word "" + word + "" not found in the string.");
```

```
Enter a string:
Kolkata
Enter the word to search for:
a
Last index of 'a' in the string: 6_
```

37. Write **a Java Program to Access** the **Index of** the **Character or** String.

Code: import java.util.Scanner;

```
public class IndexOfCharacter String {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.println("Enter a string:");

        String input scanner.nextLine();
        System.out.println("Enter the character/string to search for:");
        String search
                            scanner.nextLine();
        int index = input.indexOf(search);
        if (index != -1) {
            System.out.println("Index of "" + search + "" in the string: " + index);
        } else {

            System.out.println(""" + search + not found in the
            string.");
        }
    }
}
```

```
Enter a string:
KOLKATA
Enter the character/string to search for:
A
Index of 'A' in the string: 4
```

38. Write a Java Program to Access the **Characters or the ASCII of** the **Character Available** in **the** String.

```
}
```

Code import java.util.Scanner;

```
public class CharactersASCIIInString {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.println("Enter a string:");
        String input = scanner.nextLine();

    System.out.println("Characters and corresponding ASCII values:"); for
        (int i = 0; i < input.length(); i++) {



        }
            char c=input.charAt(i);
            int asciiValue = (int) c;
            System.out.println("+c+":"+asciiValue);
```

```
Enter a string:
Kolkata
Characters and corresponding ASCII values:
'K': 75
'o': 111
'l': 108
'k': 107
'a': 97
't': 116
'a': 97
```

39. Write a Java Program to **Display the** Character **and** the Corresponding Ascii Present **in** the String.

Code: import java.util.Scanner;

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

        Scanner scanner = new Scanner(System.in);
        System.out.println("Enter a character:"); char c=
        scanner.next().charAt(0);

        int asciiValue = (int) c;
        System.out.println("ASCII value of '" + c + "': " + asciiValue);
    }
}
```

```
Enter a character:
A
ASCII value of 'A': 65
```

40. Write **a Java Program** to **Accept 2 String & Check** Whether **all Characters** in First **String** is Present in **Second** String **&** Print.

Code: import java.util.Scanner;

```
public class CheckCharactersInSecondString {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.println("Enter the first string:"); String
        first scanner.nextLine();
        System.out.println("Enter the second string:");
        String second = scanner.nextLine();

        boolean allPresent = true;
        for (char c: first.toCharArray()) { if
        (second.indexOf(c) == -1) {
                allPresent = false;
                break;
            }
        }

        if (allPresent) {
            System.out.println("All characters in the first string are present in the second string.");
        } else {

string.");

    }
        }
            System.out.println("Not all characters in the first string are present in the second
```

```
Enter the first string:
java
Enter the second string:
jaava
All characters in the first string are present in the second string.
```

41. Write **a Java Program** to Check **whether** a Given **Character is** Present in a **String**, **Find Frequency & Position of Occurrence**.

Code: import java.util.Scanner;

```
public class CharacterOccurrence {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.println("Enter a string:");
        String input = scanner.nextLine();
        System.out.println("Enter the character to search for:");
        char target = scanner.next().charAt(0);
        int frequency = 0;
        for (int i = 0; i < input.length(); i++) {



        }
            if (input.charAt(i) == target) {


            }
                frequency++;
                System.out.println("Character "" + target + "" found at position: " + i);


        if (frequency == 0) {
            System.out.println("Character "" + target + "" not found in the string.");
        } else {
            System.out.println("Frequency of character "" + target +":"+frequency);
        }
    }
}
```

```
Enter a string:
KOLKATA
Enter the character to search for:
K
Character 'K' found at position: 0
Character 'K' found at position: 3
Frequency of character 'K': 2
```

42. Write **a Java Program to** Count the Number **of Occurrence of Each Character Ignoring** the **Case** of **Alphabets** & **Display them**.

Code: import java.util.HashMap;

```
import java.util.Map;
import java.util.Scanner;
public class Character FrequencyIgnoringCase {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.println("Enter a string:");
        String input = scanner.nextLine().toLowerCase();
  Map<Character, Integer> frequencyMap = new HashMap<>(); for (char c
        input.toCharArray()) {
            if (Character.isAlphabetic(c)) {
                frequencyMap.put(c, frequencyMap.getOrDefault(c, 0) + 1);

    }
}
        }
    }

        System.out.println("Character frequencies (ignoring case):");
          for (Map.Entry<Character, Integer> entry: frequencyMap.entrySet()) {
                System.out.println("" + entry.getKey() + "': " + entry.getValue());
        }
```

```
Enter a string:
java
Character frequencies (ignoring case):
'a': 2
'v': 1
'j': 1
```

43. Write a Java Program to Give **Shortest Sequence of Character Insertions and Deletions that** Turn One String Into the Other.

Code: import java.util.Scanner;

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

        int[][] dp = new int[str1.length()+1][str2.length() + 1]; for (int i
        = 0; i <= str1.length(); i++) {
            for (int j = 0; j <= str2.length(); j++) {
                if (i == 0  ||  j == 0)
                    dp[i][j] = i + j;
                else if (str1.charAt(i-1) == str2.charAt(j - 1))
                    dp[i][j] = dp[i - 1][j-1];
                else
                    dp[i][j] = 1 + Math.min(dp[i - 1][j], dp[i][j-1]);
            }
        }

        int i= str1.length();
        int j = str2.length();
  StringBuilder sequence = new StringBuilder(); while
        (i > 0 && j> 0) {
            if (str1.charAt(i-1) == str2.charAt(j - 1)) {
  i--; j--;
            } else if (dp[i - 1]] <dp[i][j-1]) {
                sequence.append("Delete").append(str1.charAt(i-1)).append(", ");
                i--;
            } else {
                sequence.append("Insert ").append(str2.charAt(j - 1)).append(", ");
                j--;
            }
        }
        while (i > 0) {
            sequence.append("Delete").append(str1.charAt(i-1)).append(", ");
            i--;
        }



        }
        while (j > 0) {
            sequence.append("Insert ").append(str2.charAt(j - 1)).append(", ");
            j--;


        if (sequence.length() > 0) {
            System.out.println("Shortest sequence of insertions and deletions:");
            System.out.println(sequence.substring(0, sequence.length() - 2));
        } else {

        }
            System.out.println("No sequence of insertions and deletions needed.");
```

```
}
Enter the first string:
UEM
Enter the second string:
UEMK
Shortest sequence of insertions and deletions:
Insert K
```

44. Write a Java Program to Check Whether Date is in Proper Format or Not.

Code: import java.text. ParseException;

```
import java.text. Simple Date Format;
import java.util.Scanner;
public class DateValidation {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.println("Enter a date (in format dd-MM-yyyy):");
        String dateStr = scanner.nextLine();
        SimpleDateFormat dateFormat = new SimpleDateFormat("dd-MM-yyyy");
        dateFormat.setLenient(false);
        try {
            dateFormat.parse(dateStr);
            System.out.println("Date is in proper format.");
        } catch (ParseException e) {

        }
    }
            System.out.println("Date is not in proper format.");


}
```

```
Enter a date (in format dd-MM-yyyy):
18-03-2024
Date is in proper format.
```

45. Write a Java Program to Validate an Email Address Format.

Code: import java.util.Scanner;

```
import java.util.regex.Matcher;
import java.util.regex.Pattern;
public class EmailValidation {
    public static void main(String[] args)
    {
  Scanner    scanner    =    new    Scanner(System.in);
        System.out.println("Enter  an  email  address:");
        String email scanner.nextLine();
        String regex = "^[a-zA-Z0-9_+&*-]+(?:\\.[a-zA-Z0-9_+&*-]+)*@(?:[a-zA-Z0-9-]+\\.)+[a-zA-
Z]{2,7}$";
```

```
 }
 Pattern pattern = Pattern.compile(regex); Matcher
     matcher = pattern.matcher(email);

     if (matcher.matches()) {
         System.out.println("Email address is valid.");
     } else {

    }
         System.out.println("Email address is not
         valid.");
```

```
C:\Users\DELL\Desktop\Program>javac EmailValidation.java

C:\Users\DELL\Desktop\Program>java EmailValidation
Enter an email address:
uem20@gmail.com
Email address is valid.
```

46. Write a Java Program to Store String Literals Using String Buffer.

```
Code: public class StringBufferExample {
  public static void main(String[] args) {
  StringBuffer buffer = new StringBuffer();
      buffer.append("Hello"); buffer.append(" ");



 }
      buffer.append("World");

      System.out.println(buffer.toString());
```

```
Hello World
```

47. Write a Java Program to Verify **a Class is** StringBuffer **Class Method**.

Code: public class StringBufferCheck {

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




 }
      String str = "Hello";
      boolean isStringBuffer = str.getClass().equals(StringBuffer.class);
      System.out.println("Is 'str' an instance of StringBuffer?" + isStringBuffer);

}
```

```
 Is 'str' an instance of StringBuffer? false
```

48. Write **a Java Program** to **Ask** the User **His Name and Greets Him** With His **Name**.

Code: import java.util.Scanner;

```
public class GreetWithName {





   }
}
    public static void main(String[] args) {
  Scanner scanner = new Scanner(System.in);
       System.out.println("Enter your name:"); String
       name = scanner.nextLine();

       System.out.println("Hello," + name + "! Nice to meet you.");
```

```
Enter your name:
Sutirtha Samanta
Hello, Sutirtha Samanta! Nice to meet you.
PS C:\Users\User\Desktop\Java\practice>
```

49. Code import java.util.Scanner;

```
public class WordGroupCount {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
    }
        System.out.println("Enter a string:");
        String input = scanner.nextLine();
        System.out.println("Enter the word or group of words to count:");
        String wordGroup = scanner.nextLine();
        int count = countWordGroupOccurrences (input, wordGroup);
        System.out.println("Number of occurrences of the word/group: " + count);


    public static int countWordGroupOccurrences (String input, String wordGroup) {
        int count = 0;
        int index = input.indexOf(wordGroup);
        while (index != -1) {
            count++;
            index= input.indexOf(wordGroup, index + 1);

        return count;
        }

    }

}
```

```
Enter a string:
Iam David, a resident of
Kolkata
Enter the word or group of words to count:
a
Number of occurrences of the word/group: 5
PS C:\Users\User\Desktop\Java\practice>
```

50. **Write a Java Program** to Count **Number** of Words **in a given Text or** Sentence.

Code: import java.util.Scanner;

```
public class WordCount {
    public static void main(String[] args) {
}
    Scanner scanner = new Scanner(System.in);
    System.out.println("Enter a text or sentence:");
    String text = scanner.nextLine();

    int wordCount = countWords(text);
    System.out.println("Number of words: " + wordCount);

public static int countWords (String text) {
    String[] words = text.split("\\s+");
    return words.length;
}
```

```
Enter a text or sentence:
Indus Valley
Number of words: 2
PS C:\Users\User\Desktop\Java\practice>
```