CS8383 Object Oriented Programming Laboratory Set A

1. Design a Java interface for ADT Stack. Implement this interface using array.Display the result for the following input 3,4,5,9,77 and print the output.

```java
interface StackInterface {
    int n = 20;
    public void push(int ele);
    public void display();
}

class StackADT implements StackInterface {
    int arr[] = new int[n];
    int top = -1;

    public void push(int ele) {
        arr[++top] = ele;
    }

    public void display() {
        if (top < 0) {
            System.out.println("Stack is empty");
            return;
        } else {
            String str = "";
            for (int i = 0; i <= top; i++)
                str = str + " " + arr[i];
            System.out.println("Elements are: " + str);
        }
    }
}

public class Stack {
    public static void main(String[] arg) {
        StackADT stk = new StackADT();
        stk.push(3);
        stk.push(4);
        stk.push(5);
        stk.push(9);
        stk.push(77);
        stk.display();
    }
}
```

2. Write a program to perform string operations using Array List. Write functions for the following
   a. Append – add at end
   b. Insert – add at index 2
   c. Search
   d. List all string starts with given letter

```java
import java.util.*;

public class ArrayListPgm {
```

```
    public static void main(String args[]) {
        List<String> listStrings = new ArrayList <String>();

        listStrings.add("One");
        listStrings.add("Two");
        listStrings.add("Three");
        listStrings.add("Four");
        System.out.println(listStrings);

        listStrings.add(2, "A2");
        System.out.println(listStrings);

        if (listStrings.contains("Hello"))
            System.out.println("Found the element");
        else
            System.out.println("There is no such element");


        for (int i = 0; i < listStrings.size(); i++) {
            String newString = listStrings.get(i);
            if (newString.startsWith("T"))
                System.out.println("The found the element is " + newString);
        }
    }
}
```

3. Write a Java program to implement user defined exception handling. Display the result for the following input
    a=1, b=0 perform c=a/b.

```
class UserException extends Exception {
    UserException(String msg) {
        super(msg);
    }
}

public class UserDefinedExcep {
    public static void main(String[] args) {
        try {
            int a = 1;
            int b = 0;
            int c = a / b;
        } catch(ArithmeticException e) {
            try {
                throw new UserException("Cannot Divide By Zero");
            } catch(UserException err) {
                System.out.println(err.toString());
            }
        }
    }
}
```

4. Develop a Java application to generate Electricity bill. Create a class with the following members: Consumer
    no., consumer name, previous month reading, current month reading, type of EB connection (i.e. domestic or
    commercial). Compute the bill amount using the following tariff.
    If the type of the EB connection is domestic, calculate the amount to be paid as follows:

    `First 150 units – Rs. 1 per unit`

    `151-250 units – Rs. 2.50 per unit`

    `251 -500 units – Rs. 4 per unit`

    `>501 units – Rs. 6 per unit`

    If the type of the EB connection is commercial, calculate the amount to be paid as follows:

    `First 150 units – Rs. 2 per unit`

151-250 units – Rs. 4.50 per unit

251 -500 units – Rs. 6 per unit

> 501 units – Rs. 7 per unit

```java
import java.util.Scanner;

class ElectricityBill {
    public static void main(String[] args) {
        String consumer_no, consumer_name;
        double prev_month_reading, current_month_reading, no_units;

        Scanner scan = new Scanner(System.in);
        System.out.println("Enter the consumer no :");
        consumer_no = scan.nextLine();
        System.out.println("Enter the consumer name :");
        consumer_name = scan.nextLine();
        System.out.println("Enter the previous month reading :");
        prev_month_reading = scan.nextFloat();
        System.out.println("Enter the current month reading :");
        current_month_reading = scan.nextFloat();
        no_units = current_month_reading - prev_month_reading;
        System.out.println("Select the type of electricity bill :");
        System.out.println("1.Domestic");
        System.out.println("2.Commercial");

        int opt = scan.nextInt();

        switch (opt) {
            case 1:
                System.out.println("---------------------------------------------");
                System.out.println(" ElectricityBill ");
                System.out.println("---------------------------------------------");
                System.out.println("Consumer name : " + consumer_name);
                System.out.println("Consumer no : " + consumer_no);
                System.out.println("No.of units : " + no_units);
                System.out.println("Electricity Bill : Rs." + domestic(no_units));
                System.out.println("---------------------------------------------");
                break;
            case 2:

                System.out.println("---------------------------------------------");
                System.out.println(" ElectricityBill ");
                System.out.println("---------------------------------------------");
                System.out.println("Consumer name : " + consumer_name);
                System.out.println("Consumer no : " + consumer_no);
                System.out.println("No.of units : " + no_units);
                System.out.println("Electricity Bill : Rs." + commercial(no_units));
                System.out.println("---------------------------------------------");
                break;
            default:
                System.out.println("Select the appropriate option!");
                break;
        }

    }

    public static double domestic(double no_units) {
        double cost = 1;
        if (no_units <= 100)
            cost = no_units * 1;
        else if (no_units >= 101 && no_units <= 200)
            cost = no_units * 2.50;
        else if (no_units >= 201 && no_units <= 500)
            cost = no_units * 4;
        else
            cost = no_units * 6;
        return cost;
```

```
        }

    public static double commercial(double no_units) {
        double cost = 1;
        if (no_units <= 100)
            cost = no_units * 2;
        else if (no_units >= 101 && no_units <= 200)
            cost = no_units * 4.50;
        else if (no_units >= 201 && no_units <= 500)
            cost = no_units * 6;
        else
            cost = no_units * 7;
        return cost;
    }
}
```

5. Develop a java application to implement currency converter (Dollar to INR, EURO to INR, Yen to INR and vice versa), distance converter (meter to KM, miles to KM and vice versa), time converter (hours to minutes, seconds and vice versa) using packages.

```
|- util
|   |- TimeConvert.java
|   |- DistanceConvert.java
|   `- CurrencyConvert.java
|
`- Converter.java
```

```
package util;
import java.util.Scanner;

public class CurrencyConvert {
    public static void currency(Scanner scan) {
        System.out.println("Choose the following :");
        System.out.println("1.DOLLAR to EURO");
        System.out.println("2.EURO to DOLLAR");
        System.out.println("3.EURO to INR");
        System.out.println("4.INR to EURO");
        System.out.println("5.Yen to EURO");
        System.out.println("6.EURO to Yen");
        int opt = scan.nextInt();
        double inr, usd, euro, yen;
        String str;
        switch (opt) {
            case 1:
                System.out.println("Enter the dollars to be converted to euro:");
                usd = scan.nextFloat();
                euro = usd * 0.88;
                System.out.printf("E%.2f", euro);
                System.out.println("\nExit? Y : N");
                str = scan.next();
                if (str.equals("N") || str.equals("n")) {
                    currency(scan);
                } else {
                    System.out.println("Thanks for using the converter ...!");
                }
                break;
            case 2:
                System.out.println("Enter the euro to be converted to dollars :");
                euro = scan.nextFloat();
                usd = euro / 0.88;
                System.out.printf("$%.2f", usd);
                System.out.println("\nExit? Y : N");
                str = scan.next();
                if (str.equals("N") || str.equals("n")) {
```

```java
                        currency(scan);
                    } else {
                        System.out.println("Thanks for using the converter ...!");
                    }
                    break;
                case 3:
                    System.out.println("Enter the euros to be converted to INR:");
                    euro = scan.nextFloat();
                    inr = euro * (80.10);
                    System.out.printf("Rs.%.2f", inr);
                    System.out.println("\nExit? Y : N");
                    str = scan.next();
                    if (str.equals("N") || str.equals("n")) {
                        currency(scan);
                    } else {
                        System.out.println("Thanks for using the converter ...!");
                    }
                    break;
                case 4:
                    System.out.println("Enter the rupees to be converted to EURO:");
                    inr = scan.nextFloat();
                    euro = inr / (80.10);
                    System.out.printf("E%.2f", euro);
                    System.out.println("\nExit? Y : N");
                    str = scan.next();
                    if (str.equals("N") || str.equals("n")) {
                        currency(scan);
                    } else {
                        System.out.println("Thanks for using the converter ...!");
                    }
                    break;

                case 5:
                    System.out.println("Enter the YEN to be converted to EURO:");
                    yen = scan.nextFloat();
                    euro = yen * 0.0077;
                    System.out.printf("E.%.2f", euro);
                    System.out.println("\nExit? Y : N");
                    str = scan.next();
                    if (str.equals("N") || str.equals("n")) {
                        currency(scan);
                    } else {
                        System.out.println("Thanks for using the converter ...!");
                    }
                    break;
                case 6:
                    System.out.println("Enter the EURO to be converted to YEN:");
                    euro = scan.nextFloat();
                    yen = euro / 0.0077;
                    System.out.printf("Y%.2f", yen);
                    System.out.println("\nExit? Y : N");
                    str = scan.next();
                    if (str.equals("N") || str.equals("n")) {
                        currency(scan);
                    } else {
                        System.out.println("Thanks for using the converter ...!");
                    }
                    break;
                default:
                    System.out.println("Select one from the above options.");
                    break;
            }
        }
    }
}
```

```java
package util;
import java.util.Scanner;
```

```java
public class DistanceConvert {
    public static void distance(Scanner scan) {
        System.out.println("Choose the following :");
        System.out.println("1.Meters to KM");
        System.out.println("2.KM to Meters");
        System.out.println("3.Meters to Inches");
        System.out.println("4.Inches to Meters");
        System.out.println("5.Meters to Feet");
        System.out.println("6.Feet to Meters");

        int opt = scan.nextInt();

        double met, km, inches, feet;
        String str;
        switch (opt) {
            case 1:
                System.out.println("Enter the metres to be converted to KM:");
                met = scan.nextFloat();
                km = met / (1000);
                System.out.printf("%.2fkm", km);
                System.out.println("\nExit? Y : N");
                str = scan.next();
                if (str.equals("N") || str.equals("n")) {
                    distance(scan);
                } else {
                    System.out.println("Thanks for using the converter ...!");
                }
                break;
            case 2:
                System.out.println("Enter the km to be converted to metres :");
                km = scan.nextFloat();
                met = km * (1000);
                System.out.printf("%.2fm", met);
                System.out.println("\nExit? Y : N");
                str = scan.next();
                if (str.equals("N") || str.equals("n")) {
                    distance(scan);
                } else {
                    System.out.println("Thanks for using the converter ...!");
                }
                break;

            case 3:
                System.out.println("Enter the meters to be converted to inches:");
                met = scan.nextFloat();
                inches = met * 39.37;
                System.out.printf("%.2inches", inches);
                System.out.println("\nExit? Y : N");
                str = scan.next();
                if (str.equals("N") || str.equals("n")) {
                    distance(scan);
                } else {
                    System.out.println("Thanks for using the converter ...!");
                }
                break;
            case 4:
                System.out.println("Enter the inches to be converted to meters:");
                inches = scan.nextFloat();
                met = inches / 39.37;
                System.out.printf("%.2fmeters", met);
                System.out.println("\nExit? Y : N");
                str = scan.next();
                if (str.equals("N") || str.equals("n")) {
                    distance(scan);
                } else {
                    System.out.println("Thanks for using the converter ...!");
                }
                break;
            case 5:
                System.out.println("Enter the meters to be converted to feet:");
```

```
                    met = scan.nextFloat();
                    feet = met * 3.281;
                    System.out.printf("%.2feet", feet);
                    System.out.println("\nExit? Y : N");
                    str = scan.next();
                    if (str.equals("N") || str.equals("n")) {
                        distance(scan);
                    } else {
                        System.out.println("Thanks for using the converter ...!");
                    }
                    break;
                case 6:
                    System.out.println("Enter the feet to be converted to meters:");
                    feet = scan.nextFloat();
                    met = feet / 3.281;
                    System.out.printf("%.2fmeters", met);
                    System.out.println("\nExit? Y : N");
                    str = scan.next();
                    if (str.equals("N") || str.equals("n")) {
                        distance(scan);
                    } else {
                        System.out.println("Thanks for using the converter ...!");
                    }
                    break;
                default:
                    System.out.println("Select one from the above options.");
                    break;
            }
        }
}
```

```
package util;
import java.util.Scanner;

public class TimeConvert {
    public static void time(Scanner scan) {
        System.out.println("Choose the following :");
        System.out.println("1.HRS TO MINS");
        System.out.println("2.MINS TO HRS");
        System.out.println("3.HRS TO SECS");
        System.out.println("4.SECS TO HRS");
        System.out.println("5.MINS TO SECS");
        System.out.println("6.SECS TO MINS");

        int opt = scan.nextInt();

        double hrs, mins, secs;
        String str;
        switch (opt) {
            case 1:
                System.out.println("Enter hrs to be converted into mins:");
                hrs = scan.nextFloat();
                mins = hrs * 60;
                System.out.printf("%.2fmins", mins);
                System.out.println("\nExit? Y : N");
                str = scan.next();
                if (str.equals("N") || str.equals("n")) {
                    time(scan);
                } else {
                    System.out.println("Thanks for using the converter ...!");
                }
                break;
            case 2:
                System.out.println("Enter mins to be converted into hrs:");
                mins = scan.nextFloat();
                hrs = mins / 60;
                System.out.printf("%.1fhr", hrs);
                System.out.println("\nExit? Y : N");
```

```java
                str = scan.next();
                if (str.equals("N") || str.equals("n")) {
                    time(scan);
                } else {
                    System.out.println("Thanks for using the converter ...!");
                }
                break;
            case 3:
                System.out.println("Enter hrs to be converted into secs:");
                hrs = scan.nextFloat();
                secs = hrs * 60 * 60;
                System.out.printf("%.2fsecs", secs);
                System.out.println("\nExit? Y : N");
                str = scan.next();
                if (str.equals("N") || str.equals("n")) {
                    time(scan);
                } else {
                    System.out.println("Thanks for using the converter ...!");
                }
                break;
            case 4:
                System.out.println("Enter secs to be converted into hrs:");
                secs = scan.nextFloat();
                hrs = secs / (60 * 60);
                System.out.printf("%.1fhr", hrs);
                System.out.println("\nExit? Y : N");
                str = scan.next();
                if (str.equals("N") || str.equals("n")) {
                    time(scan);
                } else {
                    System.out.println("Thanks for using the converter ...!");
                }
                break;
            case 5:
                System.out.println("Enter mins to be converted into secs:");
                mins = scan.nextFloat();
                secs = mins * 60;
                System.out.printf("%.2fsecs", secs);
                System.out.println("\nExit? Y : N");
                str = scan.next();
                if (str.equals("N") || str.equals("n")) {
                    time(scan);
                } else {
                    System.out.println("Thanks for using the converter ...!");
                }
                break;
            case 6:
                System.out.println("Enter secs to be converted into mins:");
                secs = scan.nextFloat();
                mins = secs / 60;
                System.out.printf("%.2fmins", mins);
                System.out.println("\nExit? Y : N");
                str = scan.next();
                if (str.equals("N") || str.equals("n")) {
                    time(scan);
                } else {
                    System.out.println("Thanks for using the converter ...!");
                }
                break;
            default:
                System.out.println("Select one from the above options.");
                break;
        }
    }
}
```

```java
import util.CurrencyConvert;
import util.DistanceConvert;
```

```
import util.TimeConvert;
import java.util.Scanner;

public class Converter {
    public static void main(String...args) {
        CurrencyConvert c = new CurrencyConvert();
        DistanceConvert d = new DistanceConvert();
        TimeConvert t = new TimeConvert();
        Scanner scan = new Scanner(System.in);

        System.out.println("Select \n1 for currency converter :\n2 for distance converter:\n3 for time converter: ");
        int choice = scan.nextInt();
        switch (choice) {
            case 1:
                c.currency(scan);
                break;
            case 2:
                d.distance(scan);
                break;
            case 3:
                t.time(scan);
            default:
                System.out.println("Please choose an appropriate option!");
                break;
        }
    }
}
```

6. Develop a java application with Employee class with Emp_name, Emp_id, Address, Mail_id, Mobile_no as members. Inherit the classes, Programmer, Assistant Professor, Associate Professor and Professor from employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 % of BP as HRA, 12% of BP as PF, 0.1% of BP for staff club fund. Generate pay slips for the employees with their gross and net salary.

```
import java.util.Scanner;

class Employee {
    String emp_name, emp_id, address, mail_id, mobile;
    public static void main(String[] args) {
        Scanner scan = new Scanner(System.in);
        System.out.println("Choose the employee category : ");
        System.out.println("1.Programmer");
        System.out.println("2.Assistant Professor");
        System.out.println("3.Associate Professor");
        System.out.println("4.Professor");
        int cat = scan.nextInt();

        switch (cat) {
            case 1:
                Programmer programmer = new Programmer();
                programmer.read();
                programmer.calculate();
                programmer.display();
                break;
            case 2:
                AssistantProfessor assistant = new AssistantProfessor();
                assistant.read();
                assistant.calculate();
                assistant.display();
                break;
            case 3:
                AssociateProfessor associate = new AssociateProfessor();
                associate.read();
                associate.calculate();
                associate.display();
```

```java
                break;
            case 4:
                Professor professor = new Professor();
                professor.read();
                professor.calculate();
                professor.display();
                break;
            default:
                System.out.println("Choose the above category!");
                break;
        }
    }
}

class Programmer extends Employee {
    double basic_pay, da, hra, pf, fund;
    double gross, net;
    Scanner scan = new Scanner(System.in);

    public void read() {
        System.out.println("Enter the employee name : ");
        emp_name = scan.nextLine();
        System.out.println("Enter the employee id : ");
        emp_id = scan.nextLine();
        System.out.println("Enter the employee address : ");
        address = scan.nextLine();
        System.out.println("Enter the employee mail_id : ");
        mail_id = scan.nextLine();
        System.out.println("Enter the employee mobile : ");
        mobile = scan.next();
        if (mobile.length() != 10) {
            System.out.println("Enter the correct mobile number :\n");
            mobile = scan.next();
        }
        System.out.println("Enter the basic pay (BP) :");
        basic_pay = scan.nextFloat();
    }

    public void calculate() {
        da = (basic_pay * 97) / 100;
        hra = (basic_pay * 10) / 100;
        pf = (basic_pay * 12) / 100;
        fund = (basic_pay * 0.1) / 100;
        gross = basic_pay + da + hra;
        net = gross - pf - fund;
    }

    public void display() {
        System.out.println("Employee name : " + emp_name);
        System.out.println("Employee id : " + emp_id);
        System.out.println("Employee address : " + address);
        System.out.println("Employee mail : " + mail_id);
        System.out.println("Employee mobile : " + mobile);
        System.out.println("-----------------------------------------------------------------------");
        System.out.println(" PAY SLIP(Programmer) ");
        System.out.println("-----------------------------------------------------------------------");
        System.out.println("DA : Rs." + da + "\t\t\t" + "PF : Rs." + pf);
        System.out.println("HRA : Rs." + hra + "\t\t\t" + "FUND : Rs." + fund);
        System.out.println("-----------------------------------------------------------------------");
        System.out.println("Gross salary : Rs." + gross + "\t\t\t" + "Net salary : Rs." + net);
        System.out.println("-----------------------------------------------------------------------");
    }
}

class AssistantProfessor extends Employee {
    double basic_pay, da, hra, pf, fund;
    double gross, net;
    Scanner scan = new Scanner(System.in);

    public void read() {
```

```java
            System.out.println("Enter the employee name : ");
            emp_name = scan.nextLine();
            System.out.println("Enter the employee id : ");
            emp_id = scan.nextLine();
            System.out.println("Enter the employee address : ");
            address = scan.nextLine();
            System.out.println("Enter the employee mail_id : ");
            mail_id = scan.nextLine();
            System.out.println("Enter the employee mobile : ");
            mobile = scan.next();
            if (mobile.length() != 10) {
                System.out.println("Enter the correct mobile number :\n");
                mobile = scan.next();
            }
            System.out.println("Enter the basic pay (BP) :");
            basic_pay = scan.nextFloat();
    }

    public void calculate() {
        da = (basic_pay * 97) / 100;
        hra = (basic_pay * 10) / 100;
        pf = (basic_pay * 12) / 100;
        fund = (basic_pay * 0.1) / 100;
        gross = basic_pay + da + hra;
        net = gross - pf - fund;
    }

    public void display() {
        System.out.println("Employee name : " + emp_name);
        System.out.println("Employee id : " + emp_id);
        System.out.println("Employee address : " + address);
        System.out.println("Employee mail : " + mail_id);
        System.out.println("Employee mobile : " + mobile);
        System.out.println("-----------------------------------------------------------------------");
        System.out.println(" PAY SLIP(AssistantProfessor) ");
        System.out.println("-----------------------------------------------------------------------");
        System.out.println("DA : Rs." + da + "\t\t\t" + "PF : Rs." + pf);
        System.out.println("HRA : Rs." + hra + "\t\t\t" + "FUND : Rs." + fund);
        System.out.println("-----------------------------------------------------------------------");
        System.out.println("Gross salary : Rs." + gross + "\t\t\t" + "Net salary : Rs." + net);
        System.out.println("-----------------------------------------------------------------------");
    }
}

class AssociateProfessor extends Employee {
    double basic_pay, da, hra, pf, fund;
    double gross, net;
    Scanner scan = new Scanner(System.in);
    public void read() {
        System.out.println("Enter the employee name : ");
        emp_name = scan.nextLine();
        System.out.println("Enter the employee id : ");
        emp_id = scan.nextLine();
        System.out.println("Enter the employee address : ");
        address = scan.nextLine();
        System.out.println("Enter the employee mail_id : ");
        mail_id = scan.nextLine();
        System.out.println("Enter the employee mobile : ");
        mobile = scan.next();
        if (mobile.length() != 10) {
            System.out.println("Enter the correct mobile number :\n");
            mobile = scan.next();
        }
        System.out.println("Enter the basic pay (BP) :");
        basic_pay = scan.nextFloat();
    }

    public void calculate() {
        da = (basic_pay * 97) / 100;
        hra = (basic_pay * 10) / 100;
```

```
            pf = (basic_pay * 12) / 100;
            fund = (basic_pay * 0.1) / 100;
            gross = basic_pay + da + hra;
            net = gross - pf - fund;
        }

    public void display() {
            System.out.println("Employee name : " + emp_name);
            System.out.println("Employee id : " + emp_id);
            System.out.println("Employee address : " + address);
            System.out.println("Employee mail : " + mail_id);
            System.out.println("Employee mobile : " + mobile);
            System.out.println("---------------------------------------------------------------------------");
            System.out.println(" PAY SLIP(AssociateProfessor) ");
            System.out.println("---------------------------------------------------------------------------");
            System.out.println("DA : Rs." + da + "\t\t\t" + "PF : Rs." + pf);
            System.out.println("HRA : Rs." + hra + "\t\t\t" + "FUND : Rs." + fund);
            System.out.println("---------------------------------------------------------------------------");
            System.out.println("Gross salary : Rs." + gross + "\t\t\t" + "Net salary : Rs." + net);
            System.out.println("---------------------------------------------------------------------------");
        }
}

class Professor extends Employee {
    double basic_pay, da, hra, pf, fund;
    double gross, net;
    Scanner scan = new Scanner(System.in);
    public void read() {
            System.out.println("Enter the employee name : ");
            emp_name = scan.nextLine();
            System.out.println("Enter the employee id : ");
            emp_id = scan.nextLine();
            System.out.println("Enter the employee address : ");
            address = scan.nextLine();
            System.out.println("Enter the employee mail_id : ");
            mail_id = scan.nextLine();
            System.out.println("Enter the employee mobile : ");
            mobile = scan.next();
            if (mobile.length() != 10) {
                System.out.println("Enter the correct mobile number :\n");
                mobile = scan.next();
            }
            System.out.println("Enter the basic pay (BP) :");
            basic_pay = scan.nextFloat();
        }

    public void calculate() {
            da = (basic_pay * 97) / 100;
            hra = (basic_pay * 10) / 100;
            pf = (basic_pay * 12) / 100;
            fund = (basic_pay * 0.1) / 100;
            gross = basic_pay + da + hra;
            net = gross - pf - fund;
        }

    public void display() {
            System.out.println("Employee name : " + emp_name);
            System.out.println("Employee id : " + emp_id);
            System.out.println("Employee address : " + address);
            System.out.println("Employee mail : " + mail_id);
            System.out.println("Employee mobile : " + mobile);
            System.out.println("---------------------------------------------------------------------------");
            System.out.println(" PAY SLIP(Professor) ");
            System.out.println("---------------------------------------------------------------------------");
            System.out.println("DA : Rs." + da + "\t\t\t" + "PF : Rs." + pf);
            System.out.println("HRA : Rs." + hra + "\t\t\t" + "FUND : Rs." + fund);
            System.out.println("---------------------------------------------------------------------------");
            System.out.println("Gross salary : Rs." + gross + "\t\t\t" + "Net salary : Rs." + net);
            System.out.println("---------------------------------------------------------------------------");
```

```
    }
}
```

7. To Write a Java Program to create an abstract class named sumOfTwo and sum of Three. Perform addition of two numbers and addition of three numbers.

```
abstract class sumOfTwo {
    abstract int add(int a, int b);
}

abstract class sumOfThree extends sumOfTwo {
    abstract int add(int a, int b, int c);
}

public class AbstractClass extends sumOfThree {
    public int add(int a, int b) {
        return (a + b);
    }
    public int add(int a, int b, int c) {
        return (a + b + c);
    }
    public static void main(String[] args) {
        AbstractClass m = new AbstractClass();
        System.out.println("Sum of 10 & 9: " + m.add(10, 9));
        System.out.println("Sum of 11, 7 & 1: " + m.add(11, 7, 1));
    }
}
```

8. Write a Java program that reads a file name from the user, displays information about whether the file exists, whether the file is readable, or writable, the type of file and the length of the file in bytes.

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

class FileInfo {
    public static String getExtension(String path) {
        int dot = path.lastIndexOf(".");
        return path.substring(dot + 1);
    }
    public static void main(String[] args) {
        Scanner scan = new Scanner(System.in);
        System.out.print("Enter the file name with extension: ");
        String name = scan.nextLine();
        File file = new File(name);
        String path = file.getAbsolutePath();
        System.out.println("File exists : " + file.exists());
        System.out.println("Readable : " + file.canRead());
        System.out.println("Writable : " + file.canWrite());
        System.out.println("Length of file : " + file.length() + " bytes");
        System.out.println("File Type : " + getExtension(path));
    }
}
```

9. Create a new class which implements java.lang.Runnable interface and override run() method. Perform multithreading operation.

```
class MThread implements Runnable {
  public void run() {
    try {
      System.out.println("Thread " + Thread.currentThread().getId() + " is running");
```

```
      }
      catch (Exception e) {
        System.out.println("Exception is caught");
      }
    }
  }
}

class MultiThread {
  public static void main(String[] args) {
    int n = 8;
    for (int i = 0; i < n; i++) {
      Thread obj = new Thread(new MThread());
      obj.start();
    }
  }
}
```

10. Design a calculator using event-driven programming paradigm of Java with Decimal manipulations.

```
import java.awt.Color;
import java.awt.Container;
import java.awt.FlowLayout;
import java.awt.event.ActionEvent;
import java.awt.event.ActionListener;
import javax.swing.JFrame;
import javax.swing.JLabel;
import javax.swing.JButton;
import javax.swing.JTextField;

public class Calculator extends JFrame implements ActionListener {
    JButton one, two, three, four, five, six, seven, eight, nine;
    JButton num0, add, sub, div, mult, equalto, exit, point, reset;
    JTextField textField;
    String s = "", ope = "";
    double total1;
    double input1, input2;
    void total(double input1, double input2, String ope) {
       String total;
       if (ope.equalsIgnoreCase("+")) {
          total1 = input1 + input2;
          total = Double.toString(total1);
          textField.setText(total);
       } else if (ope.equalsIgnoreCase("-")) {
          total1 = input1 - input2;
          total = Double.toString(total1);
          textField.setText(total);
       } else if (ope.equalsIgnoreCase("*")) {
          total1 = input1 * input2;
          total = Double.toString(total1);
          textField.setText(total);
       } else if (ope.equalsIgnoreCase("/")) {
          total1 = input1 / input2;
          total = Double.toString(total1);
          textField.setText(total);
       }
    }
    public Calculator() {
       Container container = getContentPane();
       container.setLayout(new FlowLayout());
       JLabel jl = new JLabel(" My Demo Calculator ");
       textField = new JTextField(15);
       one = new JButton(" 1 ");
       two = new JButton(" 2 ");
       three = new JButton(" 3 ");
       four = new JButton(" 4 ");
       five = new JButton(" 5 ");
       six = new JButton(" 6 ");
```

```java
            seven = new JButton(" 7 ");
            eight = new JButton(" 8 ");
            nine = new JButton(" 9 ");
            num0 = new JButton(" 0 ");
            add = new JButton(" + ");
            sub = new JButton(" - ");
            div = new JButton(" / ");
            mult = new JButton(" * ");
            equalto = new JButton(" = ");
            exit = new JButton(" Exit ");
            point = new JButton(" . ");
            reset = new JButton("C");
            reset.setBackground(Color.YELLOW);
            // listener
            one.addActionListener(this);
            two.addActionListener(this);
            three.addActionListener(this);
            four.addActionListener(this);
            five.addActionListener(this);
            six.addActionListener(this);
            seven.addActionListener(this);
            eight.addActionListener(this);
            nine.addActionListener(this);
            num0.addActionListener(this);
            add.addActionListener(this);
            sub.addActionListener(this);
            mult.addActionListener(this);
            div.addActionListener(this);
            equalto.addActionListener(this);
            exit.addActionListener(this);
            point.addActionListener(this);
            reset.addActionListener(this);
            container.add(jl);
            container.add(textField);
            container.add(one);
            container.add(two);
            container.add(three);
            container.add(add);
            container.add(four);
            container.add(five);
            container.add(six);
            container.add(sub);
            container.add(seven);
            container.add(eight);
            container.add(nine);
            container.add(div);
            container.add(num0);
            container.add(point);
            container.add(mult);
            container.add(equalto);
            container.add(reset);
            container.add(exit);
        }
        public static void main(String arg[]) {
            Calculator d = new Calculator();
            d.setSize(260, 300);
            d.setVisible(true);
        }
        public void actionPerformed(ActionEvent e) {
            Object o = e.getSource();
            if (o == one) {
                textField.setText(s.concat("1"));
                s = textField.getText();
            } else if (o == two) {
                textField.setText(s.concat("2"));
                s = textField.getText();
            } else if (o == three) {
                textField.setText(s.concat("3"));
                s = textField.getText();
            } else if (o == four) {
```

```
            textField.setText(s.concat("4"));
            s = textField.getText();
        } else if (o == five) {
            textField.setText(s.concat("5"));
            s = textField.getText();
        } else if (o == six) {
            textField.setText(s.concat("6"));
            s = textField.getText();
        } else if (o == seven) {
            textField.setText(s.concat("7"));
            s = textField.getText();
        } else if (o == eight) {
            textField.setText(s.concat("8"));
            s = textField.getText();
        } else if (o == nine) {
            textField.setText(s.concat("9"));
            s = textField.getText();
        } else if (o == num0) {
            textField.setText(s.concat("0"));
            s = textField.getText();
        } else if (o == add) {
            textField.setText("");
            input1 = Double.parseDouble(s);
            s = "";
            ope = "+";
        } else if (o == sub) {
            textField.setText("");
            input1 = Double.parseDouble(s);
            s = "";
            ope = "-";
        } else if (o == mult) {
            textField.setText("");
            input1 = Double.parseDouble(s);
            s = "";
            ope = "*";
        } else if (o == div) {
            textField.setText("");
            input1 = Double.parseDouble(s);
            s = "";
            ope = "/";
        } else if (o == equalto) {
            input2 = Double.parseDouble(s);
            total(input1, input2, ope);
            System.out.println(input1);
            System.out.println(input2);
            System.out.println(total1);
        } else if (o == exit) {
            System.exit(0);
        } else if (o == point) {
            textField.setText(s.concat("."));
            s = textField.getText();
        }
        if (o == reset) {
            textField.setText("");
            s = textField.getText();
            total1 = 0;
        }
    }
}
```

11. Write a program to Check Prime Number using Interface.

```
import java.util.Scanner;

interface Prime {
    void isPrime(int num);
}
```

```
public class PrimeCheck implements Prime {
    public void isPrime(int num) {
        boolean flag = false;
        for (int i = 2; i <= num / 2; ++i) {
            if (num % i == 0) {
                flag = true;
                break;
            }
        }
        System.out.printf("The given number is %s", !flag ? "prime" : "composite");
    }
    public static void main(String[] args) {
        Scanner s = new Scanner(System.in);
        PrimeCheck m = new PrimeCheck();
        System.out.print("Enter the num: ");
        int n = s.nextInt();
        m.isPrime(n);
    }
}
```

12. (i) Write a program to display Fibonacci series using recursion
    (ii) Write a Java Program to Check a Leap Year using inheritance concept.

```
class Fibonacci {
    static int n1 = 0, n2 = 1, n3 = 0;
    static void printFibonacci(int count) {
        if (count > 0) {
            n3 = n1 + n2;
            n1 = n2;
            n2 = n3;
            System.out.print(" " + n3);
            printFibonacci(count - 1);
        }
    }
    public static void main(String args[]) {
        int count = 10;
        System.out.print(n1 + " " + n2);
        printFibonacci(count - 2);
    }
}
```

```
import java.util.Scanner;

class LeapCheck {
    public static void check(int year) {
        if (((year % 4 == 0) && (year % 100!= 0)) || (year%400 == 0))
            System.out.println("Leap year");
        else
            System.out.println("Not a leap year");
    }
}

public class Leap extends LeapCheck {
   public static void main(String[] args){
      System.out.print("Enter an Year: ");
      Scanner sc = new Scanner(System.in);
      int year = sc.nextInt();
      check(year);
   }
}
```

13. Write a java program to find the maximum value from the given type of elements using a generic function.

```
public class Max {
    public static <T extends Comparable<T>> T max(T x, T y, T z) {
        T max = x;
        if (y.compareTo(max) > 0)
            max = y;
        if (z.compareTo(max) > 0)
            max = z;
        return max;
    }

    public static void main(String args[]) {
        System.out.printf("Maximum of %d, %d and %d is %d\n", 3, 4, 5, max(3, 4, 5));
        System.out.printf("Maximum of %.1f, %.1f and %.1f is %.1f\n", 6.6, 8.8, 7.7, max(6.6, 8.8, 7.7));
        System.out.printf("Maximum of %s, %s and %s is %s\n", "pear", "apple", "orange", max("pear", "apple", "orange"));
    }
}
```

14. Write a java program that prints numbers from 1 to 10 line by line after every 5 seconds.

```
public class FiveSec {
    public static void main(String[] args) {
        try {
            for(int i = 0; i <= 10; i++) {
                System.out.println(i);
                Thread.sleep(5000);
            }
        } catch(InterruptedException e) {
            System.out.println("Thread Interrupted");
        }
    }
}
```

15. Develop the Internal mark calculation system based on the attendance percentage using Java. Get the student
    name, register number, total number of working days in the semester and Number of days present. Calculate
    attendance percentage of the students and award attendance mark based on the following condition.
    Attendance percentage >=90 – 5 Marks
    Attendance percentage >=80 and < 90 – 4 Marks
    Attendance percentage >=75 and < 80 – 3 Marks
    Attendance percentage < 75 - 0 Marks

```
import java.util.Scanner;

public class Attendance {
    public static void main(String[] args) {
        Scanner in = new Scanner(System.in);
        String name;
        int regno, days, total;
        System.out.println("Enter the name of the student: ");
        name = in .next();
        System.out.println("Enter the Register number of the student: ");
        regno = in .nextInt();
        System.out.println("Enter total number of  days : ");
        total = in .nextInt();
        System.out.println("Enter total number of according days present: ");
        days = in .nextInt();
        double attendance_perc = (100 * days) / total;
        int marks = 0;
        if (attendance_perc >= 90)
            marks = 5;
        else if (attendance_perc >= 80 && attendance_perc < 90)
```

```
            marks = 4;
        else if (attendance_perc >= 75 && attendance_perc < 80)
            marks = 3;
        else if (attendance_perc < 75)
            marks = 0;
        System.out.println("Name: " + name);
        System.out.println("Register No:" + regno);
        System.out.println("Total Number of days: " + total);
        System.out.println("Number of days: " + days);
        System.out.println("Marks: " + marks);
    }
}
```

16. Write a Java program for implementing producer consumer problem using Inter-thread communication.

```java
import java.util.LinkedList;

public class ProducerConsumer {
    public static class PC {
        LinkedList<Integer> list = new LinkedList<>();
        int capacity = 2;

        public void produce() throws InterruptedException {
            int value = 0;
            while (true) {
                synchronized (this) {
                    while (list.size() == capacity)
                        wait();
                    System.out.println("Producer produced-" + value);
                    list.add(value++);
                    notify();
                    Thread.sleep(1000);
                }
            }
        }

        public void consume() throws InterruptedException {
            while (true) {
                synchronized (this) {
                    while (list.size() == 0)
                        wait();
                    int val = list.removeFirst();
                    System.out.println("Consumer consumed-" + val);
                    notify();
                    Thread.sleep(1000);
                }
            }
        }
    }

    public static void main(String[] args) throws InterruptedException {
        final PC pc = new PC();

        Thread t1 = new Thread(new Runnable() {
            @Override
            public void run() {
                try { pc.produce(); }
                catch (InterruptedException e) {
                    e.printStackTrace();
                }
            }
        });

        Thread t2 = new Thread(new Runnable() {
            @Override
            public void run() {
                try { pc.consume(); }
```

```
                catch (InterruptedException e) {
                    e.printStackTrace();
                }
            }
        });

        t1.start();
        t2.start();

        t1.join();
        t2.join();
    }
}
```

17. Write 2 Java programs one implementing Arithmetic exception and the other implementing
    ArrayIndexOutOfBound exception.

```
class ArithmeticExcep {
    public static void main(String args[]) {
        try {
            int num1 = 30, num2 = 0;
            int output = num1 / num2;
            System.out.println("Result: " + output);
        } catch (ArithmeticException e) {
            System.out.println("You Shouldn't divide a number by zero");
        }
    }
}
```

```
class ArrayException {
    public static void main(String args[]) {
        try {
            int a[] = new int[10];
            a[11] = 9;
        } catch (ArrayIndexOutOfBoundsException e) {
            System.out.println("ArrayIndexOutOfBounds");
        }
    }
}
```

18. Write a java program that implements a multi-threaded application that has three threads. First thread
    generates a random integer every 10 second and if the value is even, second thread computes the square of
    the number and prints. If the value is odd, the third thread will print the value of cube of the number.

```
import java.util.Random;

class RandomNumberThread extends Thread {
    public void run() {
        Random random = new Random();
        for (int i = 0; i < 10; i++) {
            int randomInteger = random.nextInt(100);
            System.out.println("Random Integer generated : " + randomInteger);
            if((randomInteger%2) == 0) {
                SquareThread sThread = new SquareThread(randomInteger);
                sThread.start();
            }
            else {
                CubeThread cThread = new CubeThread(randomInteger);
                cThread.start();
            }
            try {
```

```
                    Thread.sleep(10000);
                }
                catch (InterruptedException ex) {
                    System.out.println(ex);
                }
            }
        }
}

class SquareThread extends Thread {
    int number;

    SquareThread(int randomNumbern) {
        number = randomNumbern;
    }

    public void run() {
        System.out.println("Square of " + number + " = " + (number * number));
    }
}

class CubeThread extends Thread {
    int number;

    CubeThread(int randomNumber) {
        number = randomNumber;
    }

    public void run() {
        System.out.println("Cube of " + number + " = " + number * number * number);
    }
}

public class MultiThreadedApp {
    public static void main(String args[]) {
        RandomNumberThread rnThread = new RandomNumberThread();
        rnThread.start();
    }
}
```

19. Write a java program to insert an element into an array and reverse an array using packages.

```
package insert;
import java.util.Scanner;

public class Insert {
    public void insert(int arr[], int n) {
        Scanner s = new Scanner(System.in);
        System.out.println("Enter the elements of array:");
        for (int i = 0; i < n; i++)
            arr[i] = s.nextInt();
    }
}
```

```
package reverse;

public class Reverse {
    public void reverse(int arr[], int n) {
        System.out.println("Reversed array is :");
        for (int i = n - 1; i >= 0; i--)
            System.out.println(arr[i]);
    }
}
```

```
import insert.Insert;
import reverse.Reverse;
import java.util.Scanner;

public class InsRev {
    public static void main(String[] args){
        Scanner s = new Scanner(System.in);
        System.out.println("Enter the size of array");
        int n = s.nextInt();
        int arr[] = new int[n];
        Insert a = new Insert();
        a.insert(arr,n);
        Reverse b = new Reverse();
        b.reverse(arr,n);
    }
}
```

20. Write a program to exhibit simple inheritance, multilevel inheritance and hybrid inheritance concepts.

```
class Parent {
    public void parentMethod() {
        System.out.println("Parent Method");
    }
}

public class single extends Parent {
    public static void main(String[] args) {
        single c = new single();
        c.parentMethod();
    }
}
```

```
class A {
    public void A() {
        System.out.println("Class A");
    }
}

class B extends A {
    public void B() {
        System.out.println("Class B");
    }
}

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

```
class C {
    public void disp() {
        System.out.println("Class C");
    }
}

class A extends C {
    public void disp() {
        System.out.println("Class A");
```

```
    }
}

class B extends C {
    public void disp() {
        System.out.println("Class B");
    }
}

public class hybrid extends A {
    public void disp() {
        System.out.println("Class D");
    }
    public static void main(String args[]) {
        hybrid obj = new hybrid();
        obj.disp();
    }
}
```