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# 16BCE0721
# JAVA LAB 5

## ASSIGNMENT 5

1. Given a positive integer n. Write a program using java to print the pyramid pattern as described in the example below.

Input: n = 5

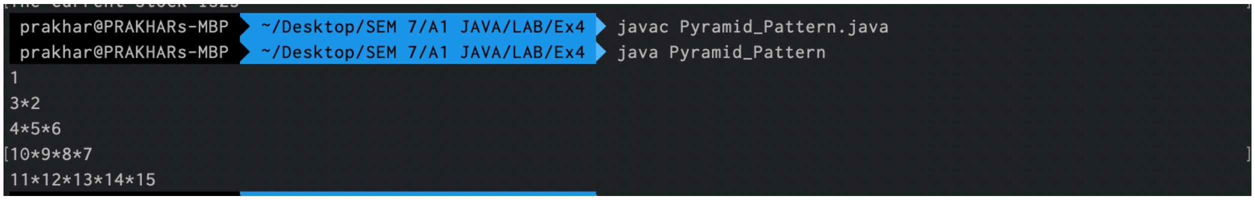
Output:

```
1

3*2

4*5*6

10*9*8*7

11*12*13*14*15
```

**CODE:**

```
public class Pyramid_Pattern {
    static void printPattern(int n)
    {
        int j, k = 0;
        for (int i=1;i<=n;i++) {
            // if row number is odd
            if (i%2 != 0) {
                for (j=k+1;j<k+i;j++)
                    System.out.print(j + "*");
                System.out.println(j++);
                k = j;
            }
            else {
                k = k+i-1;
                for (j=k;j>k-i+1;j--)
                    System.out.print(j + "*");
                System.out.println(j);
            }
        }
    }
    public static void main(String args[])
        {
            int n = 5;
            printPattern(n);
        }
}
```

**OUTPUT:**



```
 prakhar@PRAKHARs-MBP  ~/Desktop/SEM 7/A1 JAVA/LAB/Ex4  javac Pyramid_Pattern.java
 prakhar@PRAKHARs-MBP  ~/Desktop/SEM 7/A1 JAVA/LAB/Ex4  java Pyramid_Pattern
1
3*2
4*5*6
[10*9*8*7                                                                          ]
11*12*13*14*15
```

2. Write a JAVA program to print the pattern given below by taking the user input (n).

If n = 4, the pattern is given below.

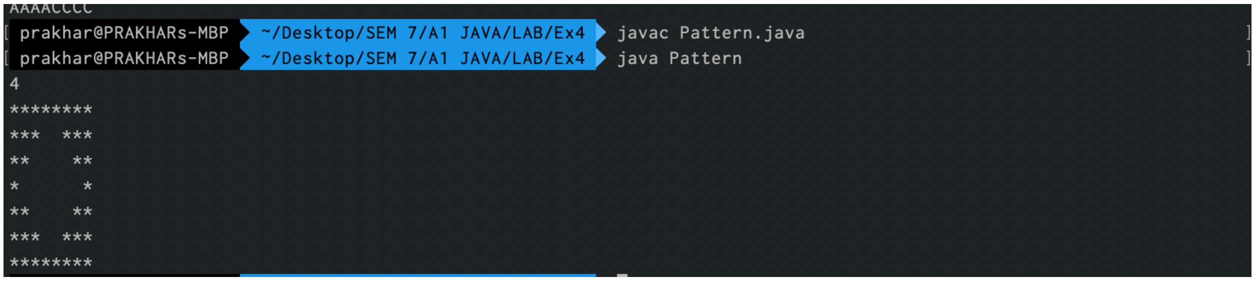
```
********
***  ***
**    **
*      *
**    **
***  ***
********
```

**CODE:**

import java.util.Scanner;

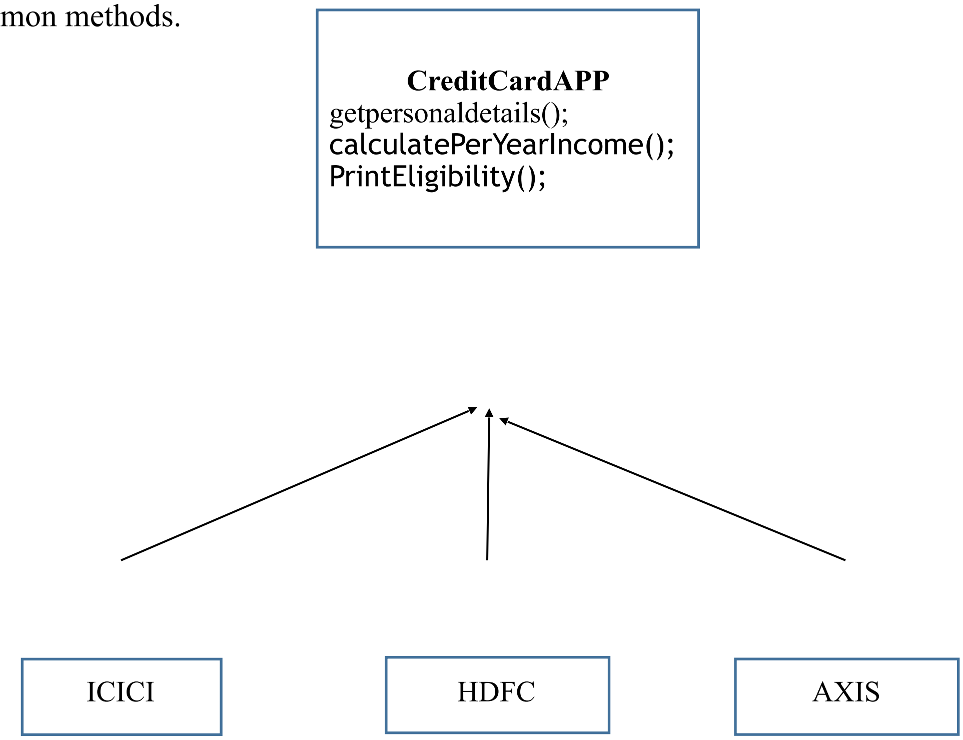
```
class Pattern{
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        int n = sc.nextInt();
        for(int i=0;i<n;i++){
            for(int j=i;j<n;j++){
                System.out.print("*");
            }
            for(int j=n-i;j<n;j++){
                System.out.print("  ");
            }
            for(int j=i;j<n;j++){
                System.out.print("*");
            }
            System.out.println();
        }

        for(int i=1;i<n;i++){
            for(int j=n-i;j<=n;j++){
                System.out.print("*");
            }
            for(int j=i+1;j<n;j++){
                System.out.print("  ");
            }
            for(int j=n-i;j<=n;j++){
                System.out.print("*");
            }
            System.out.println();
        }
    }
}
```

**OUTPUT:**



```
AAAACCCC
[ prakhar@PRAKHARs-MBP  ~/Desktop/SEM 7/A1 JAVA/LAB/Ex4  javac Pattern.java                    ]
[ prakhar@PRAKHARs-MBP  ~/Desktop/SEM 7/A1 JAVA/LAB/Ex4  java Pattern                          ]
4
********
***  ***
**    **
*      *
**    **
***  ***
********
```

3. The bank association has decided to automate the credit card application process in using common methods.



<u>CreditCardAPP Interface methods: </u>- The methods inside the credit card app has to be redefined in individual bank classes.

- getpersonalDetails – Method receives the name, mob, address, nominee, age, email for a customer.
- CalculatePerYearIncome – Take input of gross salary.
  - NetSalPerMonth = GrossSalary – (GrossSalary * 0.2)
  - PerYearIncome = NetSalPerMonth *12
- PrintEligibility – This is decided based on previous loan EMI. Get the input of EMI that an employee pays per month
  - EligibilityScore = 3. If employee does not pays any EMI.
  - EligibilityScore= 2. If employee pays EMI for less than 20% of his perYearIncome.

    - EligibilityScore=1. If employee pays EMI for less than 40% of his perYearIncome.
    - EligibilityScore=0. If employee pays EMI for less than 60% of his perYearIncome.

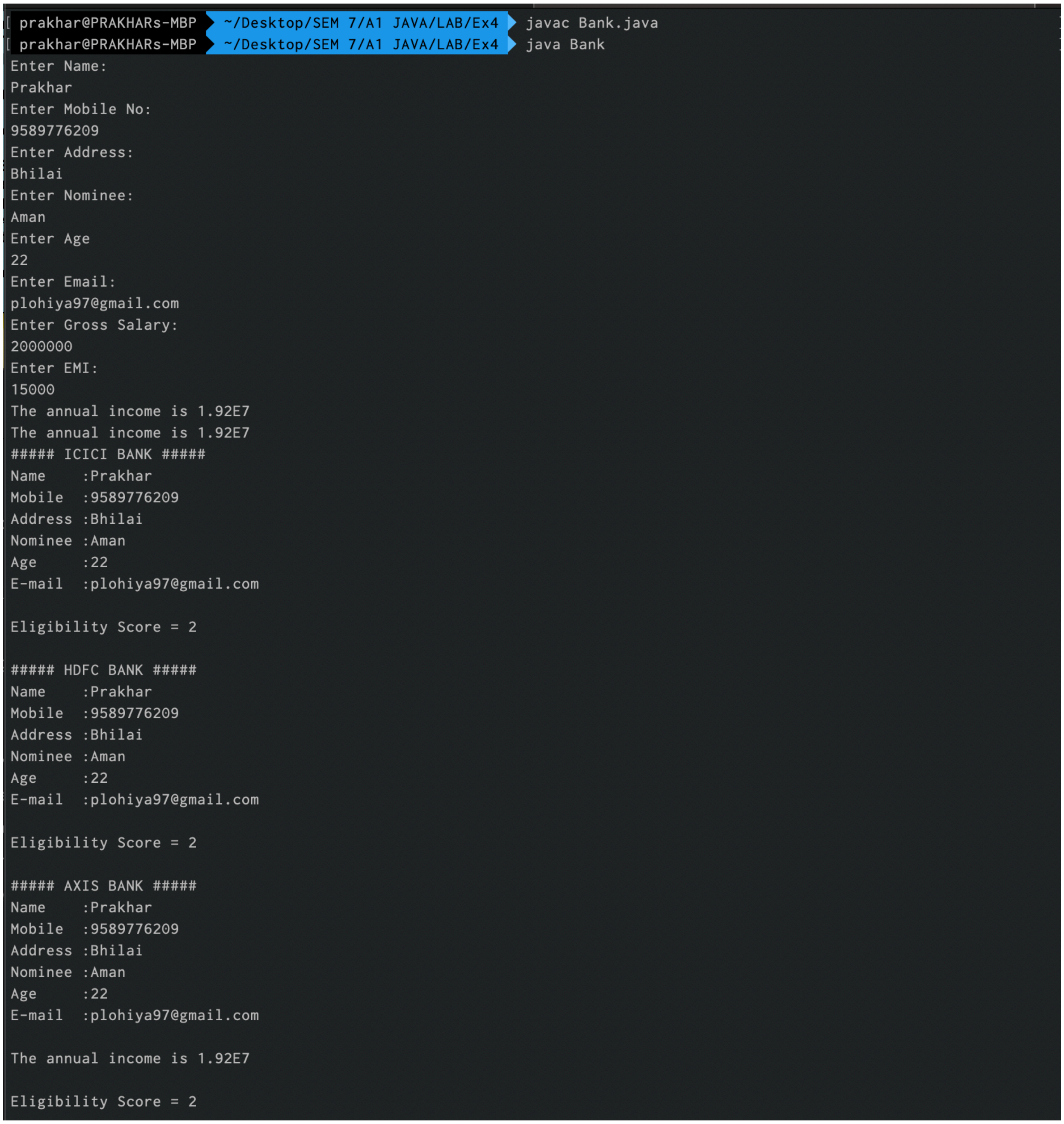
Write a Java program that creates the banking class for individual banks like ICICI, HDFC and AXIS. Redefine the methods of the interfaces in all classes.

**CODE:**

```
import java.util.Scanner;

import javafx.scene.effect.MotionBlur;

interface CreditCardAPP{
    public void getpersonaldetails(String name, String mob, String add, String nominee, int age, St
ring email);
    public void calculatePerYearIncome(double grossSalary);
    public void PrintEligibility(double EMI);
}

class ICICI implements CreditCardAPP{
    String name;
    String mob;
    String add;
    String nominee;
    int age;
    String email;
    double netSalary;
    double perYearIncome;
    int eligibilityScore;

    public void getpersonaldetails(String name, String mob, String add, String nominee, int age, St
ring email){
        this.name = name;
        this.mob = mob;
        this.add = add;
        this.nominee = nominee;
        this.age = age;
        this.email = email;
    }

    public void calculatePerYearIncome(double grossSalary) {
        netSalary = grossSalary - (grossSalary*0.2);
        perYearIncome = netSalary*12;
        System.out.println("The annual income is "+perYearIncome);
        // return perYearIncome;
    }

    public void PrintEligibility(double EMI){
        EMI = EMI*12;
        if(EMI==0)
            eligibilityScore = 3;
        else if(EMI>0 && EMI<=0.2*perYearIncome)
            eligibilityScore = 2;
        else if(EMI>0.2*perYearIncome && EMI <=0.4*perYearIncome)
            eligibilityScore = 1;
        else
            eligibilityScore = 0;

        System.out.println("##### ICICI BANK #####");
        System.out.println("Name    :"+name);
        System.out.println("Mobile  :"+mob);
        System.out.println("Address :"+add);
        System.out.println("Nominee :"+nominee);
        System.out.println("Age     :"+age);
        System.out.println("E-mail  :"+email);

        System.out.println();
        System.out.println("Eligibility Score = "+eligibilityScore);
        System.out.println();
    }

}

class HDFC implements CreditCardAPP{
    String name;
    String mob;
    String add;
    String nominee;
    int age;
    String email;
    double netSalary;
    double perYearIncome;
    int eligibilityScore;

    public void getpersonaldetails(String name, String mob, String add, String nominee, int age, St
ring email){
        this.name = name;
        this.mob = mob;
        this.add = add;
        this.nominee = nominee;
        this.age = age;
        this.email = email;
    }

    public void calculatePerYearIncome(double grossSalary) {
        netSalary = grossSalary - (grossSalary*0.2);
        perYearIncome = netSalary*12;
        System.out.println("The annual income is "+perYearIncome);
        // return perYearIncome;
    }

    public void PrintEligibility(double EMI){
        EMI = EMI*12;
        if(EMI==0)
            eligibilityScore = 3;
        else if(EMI>0 && EMI<=0.2*perYearIncome)
            eligibilityScore = 2;
        else if(EMI>0.2*perYearIncome && EMI <=0.4*perYearIncome)
            eligibilityScore = 1;
        else
            eligibilityScore = 0;

        System.out.println("##### HDFC BANK #####");
        System.out.println("Name    :"+name);
        System.out.println("Mobile  :"+mob);
        System.out.println("Address :"+add);
        System.out.println("Nominee :"+nominee);
        System.out.println("Age     :"+age);
        System.out.println("E-mail  :"+email);

        System.out.println();
        System.out.println("Eligibility Score = "+eligibilityScore);
        System.out.println();
    }
```

```
}

class AXIS implements CreditCardAPP{
    String name;
    String mob;
    String add;
    String nominee;
    int age;
    String email;
    double netSalary;
    double perYearIncome;
    int eligibilityScore;

    public void getpersonaldetails(String name, String mob, String add, String nominee, int age, St
ring email){
        this.name = name;
        this.mob = mob;
        this.add = add;
        this.nominee = nominee;
        this.age = age;
        this.email = email;
    }

    public void calculatePerYearIncome(double grossSalary) {
        netSalary = grossSalary - (grossSalary*0.2);
        perYearIncome = netSalary*12;
        // System.out.println("The annual income is "+perYearIncome);
        // return perYearIncome;
    }

    public void PrintEligibility(double EMI){
        EMI = EMI*12;
        if(EMI==0)
            eligibilityScore = 3;
        else if(EMI>0 && EMI<=0.2*perYearIncome)
            eligibilityScore = 2;
        else if(EMI>0.2*perYearIncome && EMI <=0.4*perYearIncome)
            eligibilityScore = 1;
        else
            eligibilityScore = 0;

        System.out.println("##### AXIS BANK #####");
        System.out.println("Name    :"+name);
        System.out.println("Mobile  :"+mob);
        System.out.println("Address :"+add);
        System.out.println("Nominee :"+nominee);
        System.out.println("Age     :"+age);
        System.out.println("E-mail  :"+email);

        System.out.println();
        System.out.println("The annual income is "+perYearIncome);
        System.out.println();
        System.out.println("Eligibility Score = "+eligibilityScore);
        System.out.println();
    }
}

class Bank{
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.println("Enter Name: ");
        String name = sc.nextLine();
        System.out.println("Enter Mobile No: ");
        String mob = sc.nextLine();
        System.out.println("Enter Address: ");
        String add = sc.nextLine();
        System.out.println("Enter Nominee: ");
        String nominee = sc.nextLine();
        System.out.println("Enter Age ");
        int age = Integer.parseInt(sc.nextLine());
        System.out.println("Enter Email: ");
        String email = sc.nextLine();
        System.out.println("Enter Gross Salary: ");
        double grossSalary = sc.nextDouble();
        System.out.println("Enter EMI: ");
        double EMI = sc.nextDouble();

        ICICI i = new ICICI();
        HDFC h = new HDFC();
        AXIS a = new AXIS();

        i.getpersonaldetails(name, mob, add, nominee, age, email);
        h.getpersonaldetails(name, mob, add, nominee, age, email);
        a.getpersonaldetails(name, mob, add, nominee, age, email);

        i.calculatePerYearIncome(grossSalary);
        h.calculatePerYearIncome(grossSalary);
        a.calculatePerYearIncome(grossSalary);


        i.PrintEligibility(EMI);
        h.PrintEligibility(EMI);
        a.PrintEligibility(EMI);

    }
}
```

**OUTPUT:**



```
prakhar@PRAKHARs-MBP  ~/Desktop/SEM 7/A1 JAVA/LAB/Ex4  javac Bank.java
prakhar@PRAKHARs-MBP  ~/Desktop/SEM 7/A1 JAVA/LAB/Ex4  java Bank
Enter Name:
Prakhar
Enter Mobile No:
9589776209
Enter Address:
Bhilai
Enter Nominee:
Aman
Enter Age
22
Enter Email:
plohiya97@gmail.com
Enter Gross Salary:
2000000
Enter EMI:
15000
The annual income is 1.92E7
The annual income is 1.92E7
##### ICICI BANK #####
Name    :Prakhar
Mobile  :9589776209
Address :Bhilai
Nominee :Aman
Age     :22
E-mail  :plohiya97@gmail.com

Eligibility Score = 2

##### HDFC BANK #####
Name    :Prakhar
Mobile  :9589776209
Address :Bhilai
Nominee :Aman
Age     :22
E-mail  :plohiya97@gmail.com

Eligibility Score = 2

##### AXIS BANK #####
Name    :Prakhar
Mobile  :9589776209
Address :Bhilai
Nominee :Aman
Age     :22
E-mail  :plohiya97@gmail.com

The annual income is 1.92E7

Eligibility Score = 2
```

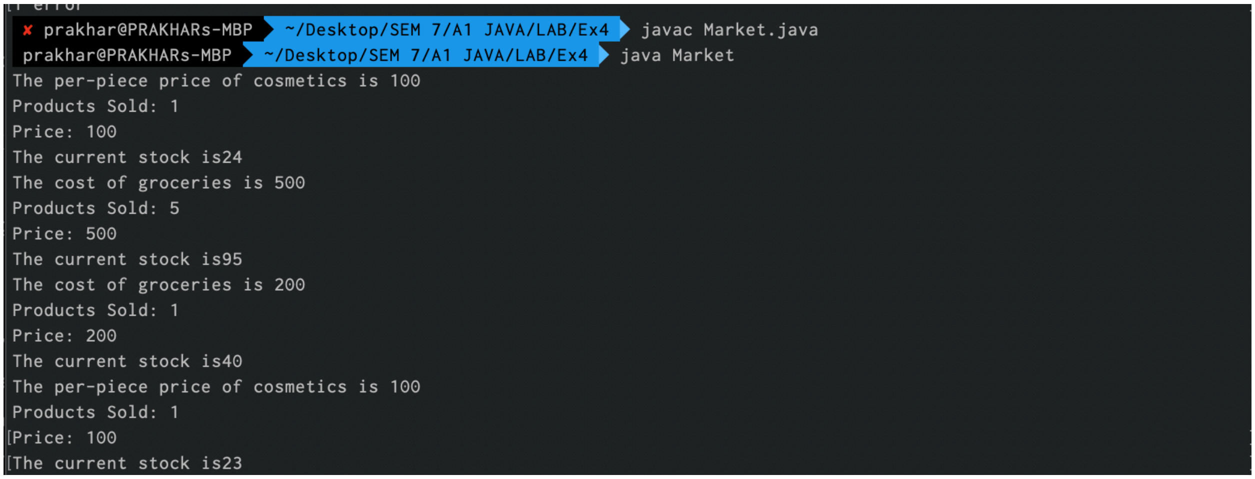
4. A super market has various products for sale. Design an abstract class to have methods like billing, stock availability for a specific product, printSaleReport. Create the subclasses according to category of products like, cosmetics, groceries, kitchenTools, snacks & chocolates. Redefine the methods in abstract class. Apply the dynamic polymorphism concept and override the printSaleReport method of the abstract class.

**CODE:**

```
abstract class SuperMarket{
   abstract void billing();
   abstract void stock();
   abstract void printSaleReport();
}

class Cosmetics extends SuperMarket{
   int count_c = 25;
   void billing(){
      System.out.println("The per-piece price of cosmetics is 100");
      // return 100;
   }
   void stock(){
      count_c--;
      System.out.println("The current stock is"+count_c);
   }
   void printSaleReport(){
      System.out.println("Products Sold: 1");
      System.out.println("Price: 100");
   }
}

class Groceries extends SuperMarket{
   int count_g = 100;
   void billing(){
      System.out.println("The cost of groceries is 500");
      // return 100;
   }
   void stock(){
      count_g = count_g-5;
      System.out.println("The current stock is"+count_g);
```

```
    }
    void printSaleReport(){
        System.out.println("Products Sold: 5");
        System.out.println("Price: 500");
    }
}

class KitchenTools extends SuperMarket{
    int count_k = 40;
    void billing(){
        System.out.println("The cost of groceries is 200");
        // return 100;
    }
    void stock(){
        count_k = count_k--;
        System.out.println("The current stock is"+count_k);
    }
    void printSaleReport(){
        System.out.println("Products Sold: 1");
        System.out.println("Price: 200");
    }
}

class SnacksAndChocolate extends SuperMarket{
    int count_snc = 500;
    void billing(){
        System.out.println("The cost of groceries is 20");
        // return 100;
    }
    void stock(){
        count_snc = count_snc--;
        System.out.println("The current stock is"+count_snc);
    }
    void printSaleReport(){
        System.out.println("Products Sold: 1");
        System.out.println("Price: 20");
    }
}

class Market{
    public static void main(String[] args) {
        SuperMarket c = new Cosmetics();
        SuperMarket g = new Groceries();
        SuperMarket k = new KitchenTools();
        SuperMarket s = new SnacksAndChocolate();

        // Cosmetics
        c.billing();
        c.printSaleReport();
        c.stock();

        // Groceries
        g.billing();
        g.printSaleReport();
        g.stock();

        // Kitchen Tools
        k.billing();
        k.printSaleReport();
        k.stock();

        // Snacks And Choclates
        c.billing();
        c.printSaleReport();
        c.stock();
    }
}
```

**OUTPUT:**



```
[1 error
 ✘ prakhar@PRAKHARs-MBP  ~/Desktop/SEM 7/A1 JAVA/LAB/Ex4  javac Market.java
 prakhar@PRAKHARs-MBP  ~/Desktop/SEM 7/A1 JAVA/LAB/Ex4  java Market
The per-piece price of cosmetics is 100
Products Sold: 1
Price: 100
The current stock is24
The cost of groceries is 500
Products Sold: 5
Price: 500
The current stock is95
The cost of groceries is 200
Products Sold: 1
Price: 200
The current stock is40
The per-piece price of cosmetics is 100
Products Sold: 1
[Price: 100
[The current stock is23
```

5. Design a class to display the schedule of trains in MGR Central railway station. The class can have its own member variable like, train_no, src, dest, time, traveltime, platformno, traveltype (A-Arrival, D-Departure). Create an array of objects in main function. Perform the following tasks.

a. SearchFunction ( ) – Takes trainno has input and perfroms a search with all objects. If found display all variable details of the class like train_no, src, dest, time, traveltime, platformno, traveltype. If not found throw arrayIndexOutofBound exception and handle it.

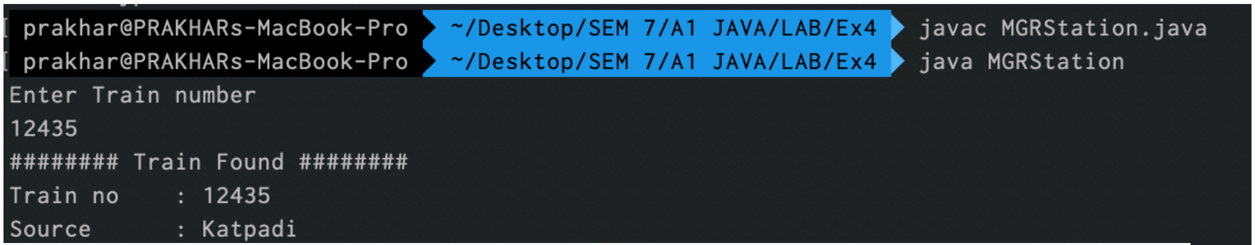
b. SortFunction ( ) – Takes the input of sorting type (TM- time based, TN – Train no based). Sort and display the records. If the user enters other than TN or TM input throw arithematic or arrayIndexOutofBound exception and handle it.

**CODE:**

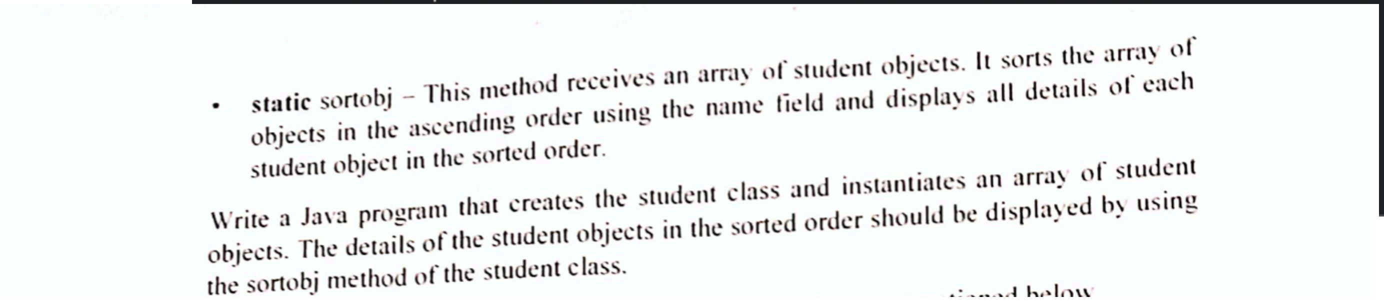
```
import java.util.Scanner;

class Train{
   int train_no;
   String src, dest;
   int time;
   int travelTime;
   int platform_no;
   String travelType; // A or D

   Train(int train_no, String src, String dest, int time, int travelTime, int platform_no, Stri
ng travelType){
      this.train_no = train_no;
      this.src = src;
      this.dest = dest;
      this.time = time;
      this.travelTime = travelTime;
      this.platform_no = platform_no;
      this.travelType = travelType;
   }
}

class MGRStation{

   public static void SearchFunction(Train[] obj, int number){
      int count = 0, t=0;
```

```
                }

        try{
            for(int i=0;i<obj.length;i++){
                if(number == obj[i].train_no){
                    count = 1;
                    t=i;
                    break;
                }
            }
            if(count == 1){
                System.out.println("######## Train Found ########");
                System.out.println("Train no    : "+obj[t].train_no);
                System.out.println("Source      : "+obj[t].src);
                System.out.println("Destination : "+obj[t].dest);
                System.out.println("Time        : "+obj[t].time);
                System.out.println("Duration    : "+obj[t].travelTime);
                System.out.println("Platform no : "+obj[t].platform_no);
                System.out.println("Travel Type : "+obj[t].travelType);
            }
            else{
                throw new ArrayIndexOutOfBoundsException("Train Not Found");
            }
        }
        catch(ArrayIndexOutOfBoundsException e){
            System.out.println(e.getMessage());
        }

    }

    public static void main(String []args){

        Scanner sc = new Scanner(System.in);

        Train t1 = new Train(12435, "Katpadi", "Chennai", 1000, 2, 10, "A");
        Train t2 = new Train(22679, "Chennai", "Bhilai", 1600, 24, 2, "D");
        Train t3 = new Train(12636, "Chennai", "Hyderabad", 4000, 12, 1, "D");

        Train obj[] = new Train[3];
        obj[0] = t1;
        obj[1] = t2;
        obj[2] = t3;

        System.out.println("Enter Train number");
        int search = Integer.parseInt(sc.nextLine());
        SearchFunction(obj, search);
    }
}
```

**OUTPUT:**



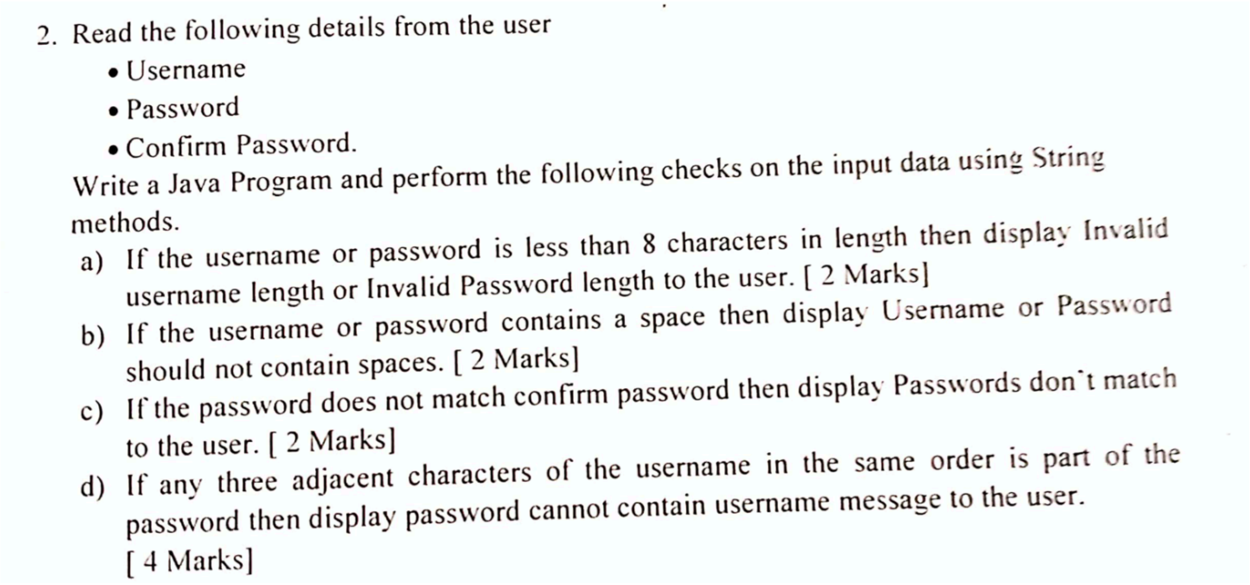
```
prakhar@PRAKHARs-MacBook-Pro  ~/Desktop/SEM 7/A1 JAVA/LAB/Ex4  javac MGRStation.java
prakhar@PRAKHARs-MacBook-Pro  ~/Desktop/SEM 7/A1 JAVA/LAB/Ex4  java MGRStation
Enter Train number
12435
######## Train Found ########
Train no     : 12435
Source       : Katpadi
```



- **static** sortobj – This method receives an array of student objects. It sorts the array of objects in the ascending order using the name field and displays all details of each student object in the sorted order.

Write a Java program that creates the student class and instantiates an array of student objects. The details of the student objects in the sorted order should be displayed by using the sortobj method of the student class.

below

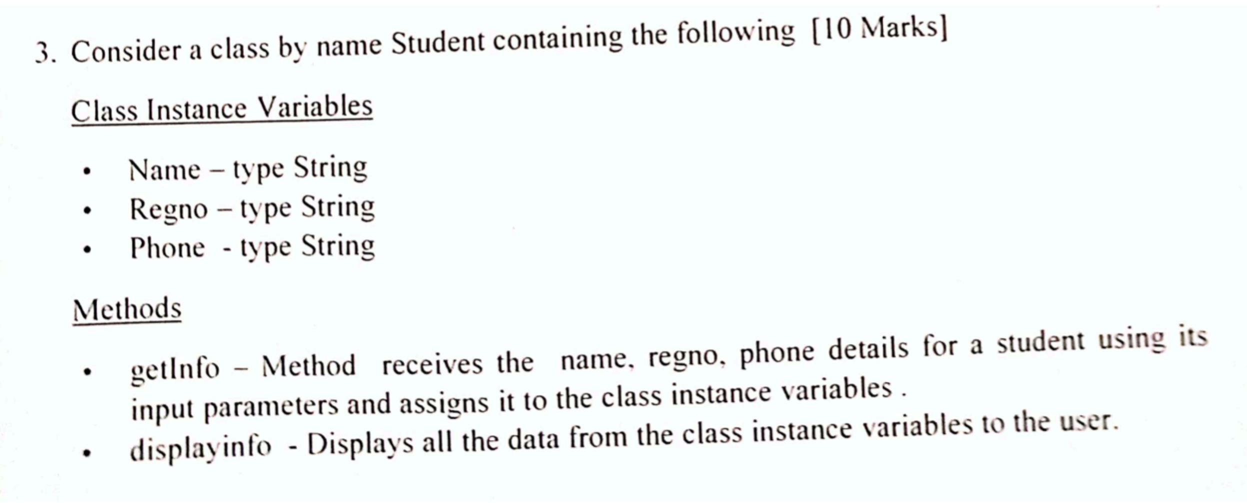


2. Read the following details from the user
   - Username
   - Password
   - Confirm Password.

   Write a Java Program and perform the following checks on the input data using String methods.

   a) If the username or password is less than 8 characters in length then display Invalid username length or Invalid Password length to the user. [ 2 Marks]
   b) If the username or password contains a space then display Username or Password should not contain spaces. [ 2 Marks]
   c) If the password does not match confirm password then display Passwords don`t match to the user. [ 2 Marks]
   d) If any three adjacent characters of the username in the same order is part of the password then display password cannot contain username message to the user. [ 4 Marks]

## PAPER 2:



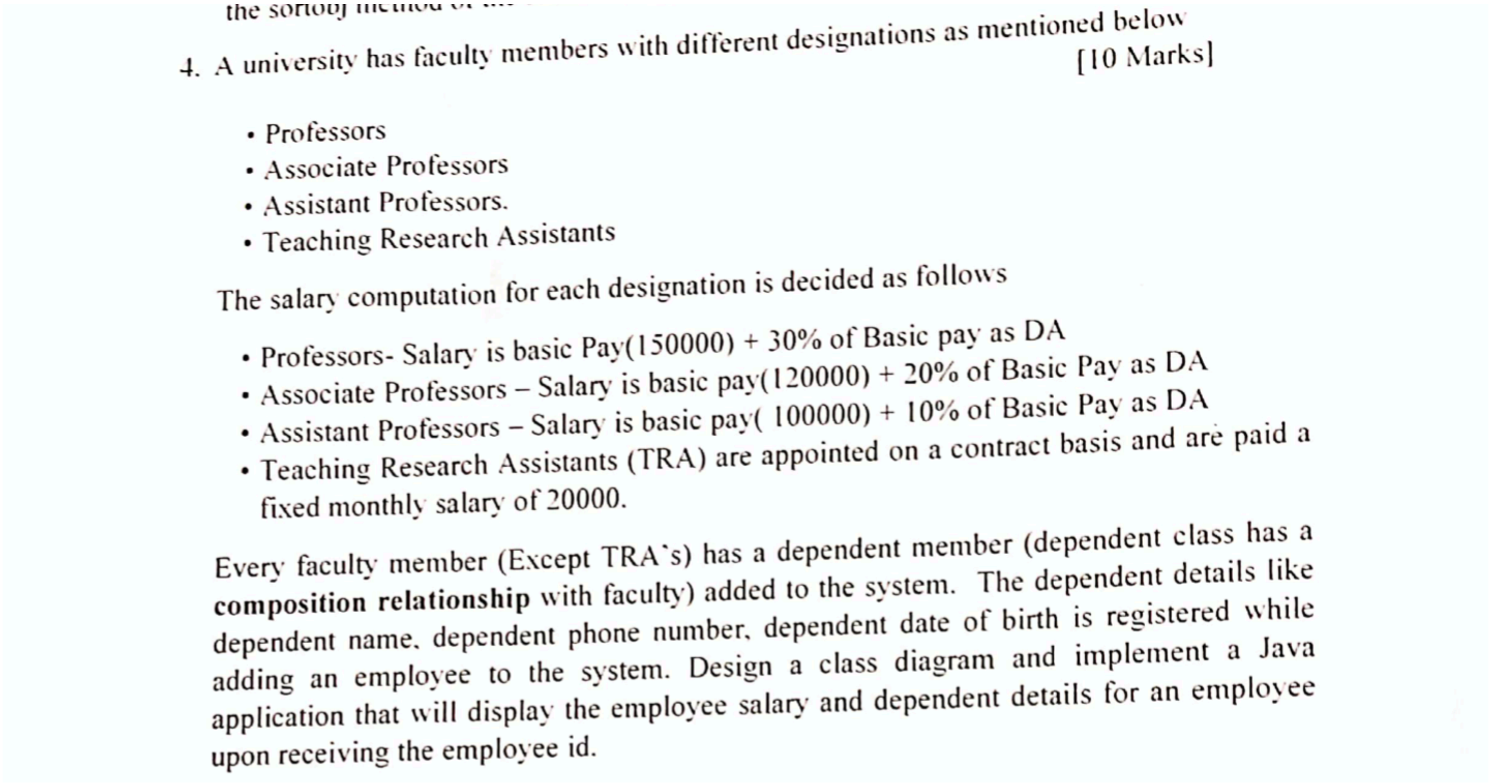
3. Consider a class by name Student containing the following [10 Marks]

<u>Class Instance Variables</u>

- Name – type String
- Regno – type String
- Phone - type String

<u>Methods</u>

- getInfo – Method receives the name, regno, phone details for a student using its input parameters and assigns it to the class instance variables .
- displayinfo - Displays all the data from the class instance variables to the user.



the sort() method of the

4. A university has faculty members with different designations as mentioned below [10 Marks]

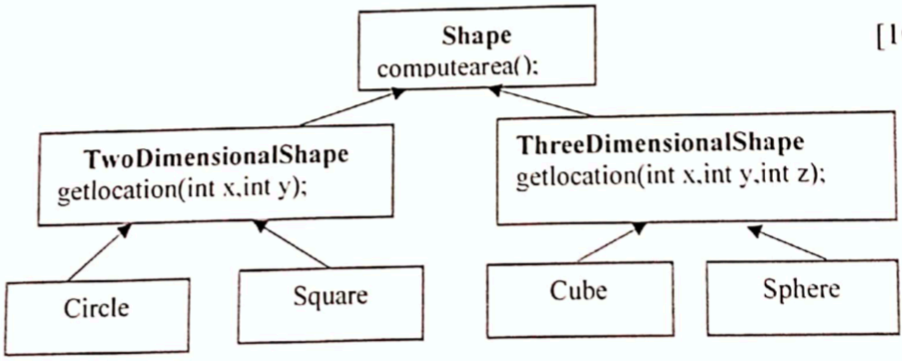
- Professors
- Associate Professors
- Assistant Professors.
- Teaching Research Assistants

The salary computation for each designation is decided as follows

- Professors- Salary is basic Pay(150000) + 30% of Basic pay as DA
- Associate Professors – Salary is basic pay(120000) + 20% of Basic Pay as DA
- Assistant Professors – Salary is basic pay( 100000) + 10% of Basic Pay as DA
- Teaching Research Assistants (TRA) are appointed on a contract basis and are paid a fixed monthly salary of 20000.

Every faculty member (Except TRA`s) has a dependent member (dependent class has a **composition relationship** with faculty) added to the system. The dependent details like dependent name, dependent phone number, dependent date of birth is registered while adding an employee to the system. Design a class diagram and implement a Java application that will display the employee salary and dependent details for an employee upon receiving the employee id.

5. [10 Marks]



Shape, TwoDimensionalShape and ThreeDimensionalShape are abstract classes with abstract methods. Create a Java program that uses an array of Shape references to objects of each concrete class in the hierarchy. Also, in the loop that processes all the shapes in the array, determine whether each shape is a two dimensional shape or a three dimensional shape. If the shape is a two dimensional shape then display its area. If the shape is a three dimensional shape then display its surface area. [Surface Area of Cube is $6a^2$ where a is a side of the cube. Surface Area of Sphere is $4\pi r^2$ where r is the radius.]. Apply the concepts of **Dynamic Polymorphism** to achieve the results.