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| **AIM:** | Polymorphism: To demonstrate method overriding. |
| **Program 1** | |
| **PROBLEM STATEMENT:** | **Consider a scenario where Bank is a class that provides functionality to get the rate of interest. However, the rate of interest varies according to banks. For example, SBI, ICICI and AXIS banks are given below.**   |  |  | | --- | --- | | Period | SBI  Interest Rate (Rates in % per annum) | | <Rs. 2 Cr | | 7–14 Days | 3.00 | | 15 –30 Days | 3.00 | | 31-45 Days | 3.00 | | 46 -90 Days | 4.05 | | 91–120 Days | 4.10 | | 121-180 Days | 4.10 |        |  |  | | --- | --- | | Period | ICICI  Interest Rate (Rates in % per annum) | | <Rs. 2 Cr | | 7–14 Days | 3.10 | | 15 –30 Days | 3.20 | | 31-45 Days | 3.50 | | 46 -90 Days | 4.50 | | 91–120 Days | 4.70 | | 121-180 Days | 4.90 |      |  |  | | --- | --- | | Period | AXIS Interest Rate (Rates in % per annum) | | <Rs. 2 Cr | | 7–14 Days | 3.15 | | 15 –30 Days | 3.15 | | 31-45 Days | 3.45 | | 46 -90 Days | 4.05 | | 91–120 Days | 4.70 | | 121-180 Days | 5.00 |   **Aayush has deposited Rs. 10000 in SBI Bank,  Rs. 12500 in ICICI Bank, and Rs. 20000 in AXIS bank respectively for a particular month.**  **You need to print the money he will get by applying the rate of interest as per the bank and days.**  **Create a class 'Bank' with a method 'get\_rate\_of\_interest' which returns 2%.**  **Make three subclasses named  SBI\_Bank, ‘ICICI\_Bank’ and 'AXIS\_bank' with a method with the same name 'get\_rate\_of\_interest' which returns the rate of interest.**  **Also, give the final amount Ayush will get from that particular bank by applying the rate of interest and period. Use Calendar Class to count the number of days and amount he will get after maturity with the date of Maturity, if he deposits today.**  **Note:**  **1.  Use compound interest**  **2. Get time period from the user**  **3. Solve using method overriding** |
| **PROGRAM:** | import java.util.\*;  class Bank {  int get\_rate\_of\_interest() {  int interest = 2;  return 2;  }  }  class SBI\_Bank extends Bank {  double get\_rate\_of\_interest(int t) {  if (t >= 7 && t <= 14) {  return 3;  }  if (t >= 15 && t <= 30) {  return 3;  }  if (t >= 31 && t <= 45) {  return 3;  }  if (t >= 46 && t <= 90) {  return 4.05;  }  if (t >= 91 && t <= 120) {  return 4.10;  }  if (t >= 121 && t <= 180) {  return 4.10;  }  return 2;  }  }  class ICICI\_Bank extends Bank {  double get\_rate\_of\_interest(int t) {  if (t >= 7 && t <= 14) {  return 3.1;  }  if (t >= 15 && t <= 30) {  return 3.2;  }  if (t >= 31 && t <= 45) {  return 3.5;  }  if (t >= 46 && t <= 90) {  return 4.5;  }  if (t >= 91 && t <= 120) {  return 4.7;  }  if (t >= 121 && t <= 180) {  return 4.9;  }  return 2;  }  }  class AXIS\_Bank extends Bank {  double get\_rate\_of\_interest(int t) {  if (t >= 7 && t <= 14) {  return 3.15;  }  if (t >= 15 && t <= 30) {  return 3.15;  }  if (t >= 31 && t <= 45) {  return 3.45;  }  if (t >= 46 && t <= 90) {  return 4.05;  }  if (t >= 91 && t <= 120) {  return 4.70;  }  if (t >= 121 && t <= 180) {  return 5;  }  return 2;  }  }  class Calender {  int date = 21;  int month = 6;  void finaldate(int t) {  int d = t % 30;  int m = t / 30;  date = d + date;  month = m + month;  if (date >= 30) {  date = date - 30;  month = month + 1;  }  System.out.println(date + " / " + month + " / 22");  }  }  public class deposit {  public static void main(String[] args) {  Scanner sc = new Scanner(System.in);  int t1, t2, t3;  SBI\_Bank sbi = new SBI\_Bank();  ICICI\_Bank icici = new ICICI\_Bank();  AXIS\_Bank axis = new AXIS\_Bank();  Calender l1 = new Calender();  Calender l2 = new Calender();  Calender l3 = new Calender();  System.out.print("Enter time period for SBI ");  t1 = sc.nextInt();  System.out.println( "Final value $" + (10000 \* Math.pow((1 + (sbi.get\_rate\_of\_interest(t1) / 100)), (float) t1 / 365)));  l1.finaldate(t1);  System.out.print("Enter time period for ICICI ");  t2 = sc.nextInt();  System.out.println( "Final value $" + (12500 \* Math.pow((1 + (icici.get\_rate\_of\_interest(t2) / 100)), (float) t2 / 365)));  l2.finaldate(t2);  System.out.print("Enter time period for AXIS ");  t3 = sc.nextInt();  System.out.println( "Final value $" + (20000 \* Math.pow((1 + (axis.get\_rate\_of\_interest(t3) / 100)), (float) t3 / 365)));  l3.finaldate(t3);  }  } |
| **RESULT:** | |
| **Program 2** | |
| **PROBLEM STATEMENT:** | **Ankit works at ABC Company. He noticed that different roles(positions) have different salaries and bonuses.**  **The 1st Role is an ‘Intern’ which has 3/4th of the base salary of an Employee.**  **Then there is ‘Clerk’ which has ½ of base salary.**  **And then there are ‘Manager’ who have twice the base salary of that of an employee.**  **Help him write a program in Java as follows.**  **Create a class ‘Employee’ which has a method named ‘getSalary’ which returns a base salary of Rs. 10,000. It also has methods named ‘getBonus’ which returns the bonus amount for that role(initially set to Rs. 0).**  **Make 3 subclasses for different roles which inherit the ‘Employee’ class and each has functions named ‘getSalary’ and ‘getBonus’.(You can assume values for ‘getBonus’ method)**  **Display the output for all cases. Also print the total salary received by each Employee after getting the bonus.**  **Note : Solve using method overriding** |
| **PROGRAM:** | import java.util.\*;  class employee {  int salary = 10000;  int getsalary() {  return salary;  }  }  class clerk extends employee {  int getsalary() {  return 10000 / 2;  }  int getbonus() {  return 1000;  }  }  class manager extends employee {  int getsalary() {  return 10000 \* 2;  }  int getbonus() {  return 8000;  }  }  class intern extends employee {  int getsalary() {  return 10000 \* 3 / 4;  }  int getbonus() {  return 3000;  }  }  public class salary {  public static void main(String[] args) {  employee obj = new employee();  clerk ob = new clerk();  intern o = new intern();  manager i = new manager();  System.out.println("The salary and bonus of intern is " + o.getsalary() + " and " + o.getbonus());  System.out.println("The salary and bonus of manager is " + i.getsalary() + " and " + i.getbonus());  System.out.println("The salary and bonus of clerk is " + ob.getsalary() + " and " + ob.getbonus());  }  } |
| **RESULT:** | |
| **Program 3** | |
| **PROBLEM STATEMENT:** | **Create a class named ‘Shape’ which has a method ‘getArea’, ‘getPerimeter’ and ‘getSide’ and all of them return 0. Make three subclasses for three different shapes - ‘Circle’, ‘Triangle’ and ‘Pentagon’. These subclasses inherit the ‘Shape’ class and they also have  ‘getArea’, ‘getPerimeter’ and ‘getSide’ methods.**  **Write a program for the  above scenario and display the solution.**  **Note: Solve using method overriding** |
| **PROGRAM:** | import java.util.\*;  import java.lang.Math;  class Shape {  Scanner scan = new Scanner(System.in);  double area, side, perimeter, radius, s1, s2, s3, a;    void getArea() {  area = 0;  }  void getPerimeter() {  perimeter = 0;  }  void getSide() {  side = 0;  }  }  class Circle extends Shape {  void getArea() {  area = Math.PI \* Math.pow(radius, 2);  }  void getPerimeter() {  perimeter = Math.PI \* 2 \* radius;  }  void getSide() {  System.out.print("Enter the radius of the circle: ");  radius = scan.nextDouble();  }  }  class Triangle extends Shape {  void getArea() {  double s = (s1 + s2 + s3) / 2;  area = s \* (s - s1) \* (s - s2) \* (s - s3);  area = Math.sqrt(area);  }  void getPerimeter() {  double s = (s1 + s2 + s3) / 2;  perimeter = (s \* 2);  }  void getSide() {  System.out.print("Enter the 3-sides of the triangle: ");  s1 = scan.nextDouble();  s2 = scan.nextDouble();  s3 = scan.nextDouble();  }  }  class Pentagon extends Shape {  void getArea() {  area = ((Math.sqrt(5 \* (5 + 2 \* Math.sqrt(5)))) / 4) \* Math.pow(a, 2);  }  void getPerimeter() {  perimeter = (5 \* a);  }  void getSide() {  System.out.print("Enter the side of the pentagon: ");  a = scan.nextDouble();  }  }  public class area {  public static void main(String[] args) {  Scanner scan = new Scanner(System.in);  Circle ob\_c = new Circle();  Triangle ob\_t = new Triangle();  Pentagon ob\_p = new Pentagon();  int option, flag;  while (true) {  System.out.println("\n 1) Circle \n 2) Triangle \n 3) Pentagon ");  System.out.print("Enter the Shape you want: ");  option = scan.nextInt();  switch (option) {  case 1:  ob\_c.getSide();  ob\_c.getArea();  ob\_c.getPerimeter();  System.out.printf("Area= %.2f\nPerimeter=%.2f\n", ob\_c.area, ob\_c.perimeter);  break;  case 2:  ob\_t.getSide();  ob\_t.getArea();  ob\_t.getPerimeter();  System.out.printf("Area= %.2f\nPerimeter=%.2f\n", ob\_t.area, ob\_t.perimeter);  break;  case 3:  ob\_p.getSide();  ob\_p.getArea();  ob\_p.getPerimeter();  System.out.printf("Area= %.2f\nPerimeter=%.2f\n", ob\_p.area, ob\_p.perimeter);  break;  default:  System.out.println("Invalid choice ");  break;  }  System.out.println("");  System.out.println("Do you want to continue?(yes=1/0=no)");  flag = scan.nextInt();  if (flag == 0) {  break;  }  }  }  } |
| **RESULT:** | |
| **Program 4** | |
| **PROBLEM STATEMENT:** | Imagine a publishing company that markets both book and audiocassette versions of its works. Create a class publication that stores the title (a string) and price (type float) of a publication. From this class derive two classes: book, which adds a page count (type int), and tape, which adds a playing time in minutes (type float). Each of these three classes should have a getdata() function to get its data from the user at the keyboard, and a putdata() function to display its data.  Add a class sales that holds an array of three floats so that it can record the dollar sales of a particular publication for the last three months. Include a getdata() function to get three sales amounts from the user, and a putdata() function to display the sales figures. Alter the book class so they are derived from both publication and sales. An object of class book  should input and output sales data along with its other data. Write a main() function to create a book object and a tape object and exercise their input/output capabilities. |
| **PROGRAM:** | import java.util.\*;  class sales {  Scanner sc = new Scanner(System.in);  float[] sales = new float[3];  void getdata() {  System.out.println("Enter the dollar sales of the last three months.");  for (int i = 0; i < 3; i++)  sales[i] = sc.nextFloat();  }  void putdata() {  System.out.println(sales[0] + "\t" + sales[1] + "\t" + sales[2] + "\t");  }  }  class publication extends sales {  int price;  String name;  void getdata() {  price = sc.nextInt();  name = sc.nextLine();  }  void putdata() {  System.out.println(name + " " + price);  }  }  class book extends publication {  int page;  void getdata() {  System.out.println("Enter name of book");  name = sc.nextLine();  System.out.println("Enter price of " + name);  price = sc.nextInt();  System.out.println("Enter no. of pages the book contains");  page = sc.nextInt();  System.out.println("Enter the dollar sales of the last three months.");  for (int i = 0; i < 3; i++)  sales[i] = sc.nextFloat();  }  void putdata() {  System.out.println(  name + "\t" + price + "\t" + page + "\t" + sales[0] + "\t" + sales[1] + "\t" + sales[2] + "\t");  }  }  class tape extends publication {  int time;  void getdata() {  System.out.println("Enter name of tape");  name = sc.nextLine();  System.out.println("Enter price of " + name);  price = sc.nextInt();  System.out.println("Enter playing time of " + name + " in minutes");  time = sc.nextInt();  System.out.println("Enter the dollar sales of the last three months.");  for (int i = 0; i < 3; i++)  sales[i] = sc.nextFloat();  }  void putdata() {  System.out.println(  name + "\t" + price + "\t" + time + "\t" + sales[0] + "\t" + sales[1] + "\t" + sales[2] + "\t");  }  }  public class company {  public static void main(String[] args) {  book[] b = new book[3];  tape[] t = new tape[3];  for (int i = 0; i < 3; i++) {  b[i] = new book();  t[i] = new tape();  System.out.println("ENTER DATA FOR BOOK");  b[i].getdata();  System.out.println("ENTER DATA FOR TAPE");  t[i].getdata();  }  System.out.println("Name\tPrice\tPage\tSales(3 MONTHS)\t");  for (int i = 0; i < 3; i++) {  b[i].putdata();  }  System.out.println("\n");  System.out.println("Name\tPrice\tPlaying time\tSales(3 MONTHS)\t");  for (int i = 0; i < 3; i++) {  t[i].putdata();  }  }  } |
| **RESULT:** | |
| **Program 5** | |
| **PROBLEM STATEMENT:** | **Give the definition of four classes, Person, Doctor, Patient and Billing, whose objects are records for a clinic.**  **Class Doctor will be derived from the class Person. A doctor have name and Date  (inherited from the class Person), it’s speciality; fees and income;**  **Patient will be derived from the class Person. A Patient record has the patient’s name and Date  (inherited from the class Person) and a Doctor object.**  **A Billing object will contain a Patient object, a Doctor object, Date of bill using date object and an amount due of type double. Be sure your classes have a reasonable complement of constructors,override equals(check equality of object)  and toString methods and member functions.**  **First write a driver program to test all your member functions, and then write a test program that creates at least two patients, at least two doctors, and at least two Billing records, then prints out the total income from the Billing records.**  **At the time of Billing the Patient name and doctor name equality should be checked.**  **Total bill generated will be no of days the patient admitted (admitted date + current date) \* 2000+ doctore fees \* no of days from the date of billing .**  **Update the Doctors income also simultaneously** |
| **PROGRAM:** | import java.util.\*;  class Person {  Calendar current = Calendar.getInstance();  Calendar bill = Calendar.getInstance();  Calendar admit = Calendar.getInstance();  Scanner sc = new Scanner(System.in);  String name;  int year, month, date;  void getName() {  name = sc.nextLine();  }  String setName() {  return name;  }  void getDate() {  date = sc.nextInt();  month = sc.nextInt();  year = sc.nextInt();  }  int setDate() {  bill.set(year, month - 1, date);  return 0;  }  }  class Doctor extends Person {  int salary, fee;  void getName() {  System.out.println("Enter the doctor's name:");  name = sc.nextLine();  }  String setName() {  return name;  }  void getSal() {  System.out.println("Enter the doctor's salary:");  salary = sc.nextInt();  }  int setSal() {  return salary;  }  void getFee() {  System.out.println("Enter the doctor's fee:");  fee = sc.nextInt();  }  int setFee() {  return fee;  }  void getDate() {  System.out.println("Enter the billing date (date, month, year):");  date = sc.nextInt();  month = sc.nextInt();  year = sc.nextInt();  }  int setDate() {  bill.set(year, month - 1, date);  long d3 = bill.getTimeInMillis() / (1000 \* 3600 \* 24);  return (int) d3;  }  }  class Patient extends Person {  void getName() {  System.out.println("Enter the patient's name:");  name = sc.nextLine();  }  String setName() {  return name;  }  void getDate() {  System.out.println("Enter the date when the patient was admitted:");  date = sc.nextInt();  month = sc.nextInt();  year = sc.nextInt();  }  int setDate() {  admit.set(year, month - 1, date);  long d2 = admit.getTimeInMillis() / (1000 \* 3600 \* 24);  return (int) d2;  }  }  class Billing extends Doctor {  void getDate() {  System.out.println("Enter the current date (date, month, year): ");  date = sc.nextInt();  month = sc.nextInt();  year = sc.nextInt();  }  int setDate() {  current.set(year, month - 1, date);  long d1 = current.getTimeInMillis() / (1000 \* 3600 \* 24);  return (int) d1;  }  int Total\_bill(int d1, int d2, int d3, int fee) {  int n1 = Math.abs((int) (d1 - d2));  int n2 = Math.abs((int) (d1 - d3));  int tot = ((n1 \* 2000) + (fee \* n2));  return tot;  }  }  public class clinic {  public static void main(String[] args) {  Doctor[] d = new Doctor[2];  Patient[] p = new Patient[2];  Billing[] b = new Billing[2];  for (int i = 0; i < 2; i++) {  d[i] = new Doctor();  p[i] = new Patient();  b[i] = new Billing();  b[i].getDate();  d[i].getName();  d[i].getSal();  d[i].getFee();  d[i].getDate();  p[i].getName();  p[i].getDate();  }  for (int i = 0; i < 2; i++) {  System.out.println("Doctor : " + d[i].setName());  System.out.println("Patient: " + p[i].setName());  System.out.println(  "Fees : Rs. " + b[i].Total\_bill(b[i].setDate(), p[i].setDate(), d[i].setDate(), d[i].setFee()));  System.out.println("Doctor's new salary: Rs. " + (d[i].setSal() +  b[i].Total\_bill(b[i].setDate(), p[i].setDate(), d[i].setDate(), d[i].setFee())));  }  }  } |
| **RESULT:** | |
| **CONCLUSION:** | We learned about method overriding and have implemented in the above programs. |