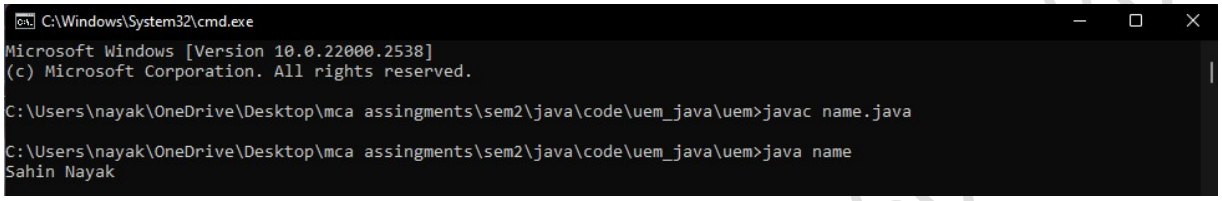
Week 1

Question 1 : Write a Java program to print your name.

Source Code :

```
public class name {
   public static void main(String[] args) {
      // Print Sahin Nayak
      System.out.println("Sahin Nayak");
   }}
```

Output :

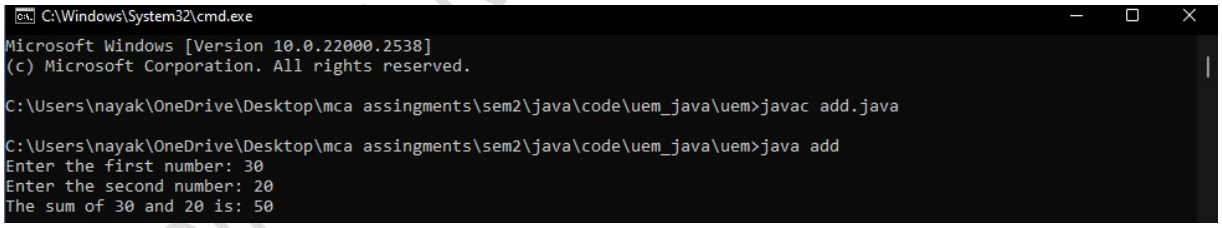


Question 2 : Write a Java program to add two numbers.

Source Code :

```
import java.util.Scanner;
public class add {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      System.out.print("Enter the first number: "); // taking input of 1st number from user
      int num1 = sc.nextInt();
      System.out.print("Enter the second number: "); // taking input of  2nd number from user
      int num2 = sc.nextInt(); // Close the scanner to prevent resource leak
      sc.close();
      int sum = num1 + num2; // Add the two numbers
      System.out.println("The sum of " + num1 + " and " + num2 + " is: " + sum);
   }}
```

Output :



Question 3 : Write a Java program to change temperature from Celsius to Fahrenheit.

Source Code :

```
import java.util.Scanner;
public class Celsius_Fahrenheit {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      System.out.println("Enter temperature in Celsius: ");
      double c = sc.nextDouble();
      double f = (c * 9/5) + 32; // convert the Celsius to Fahrenheit
      System.out.println("Temperature in Fahrenheit: " + f);
      sc.close();
   }}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>java Celsius_Fahrenheit
Enter temperature in Celsius:
36
Temperature in Fahrenheit: 96.8
```

Question 4 : Write a Java program to change temperature from Fahrenheit to Celsius.

Source Code :

```
import java.util.Scanner;
public class Fahrenheit_Celsius {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      System.out.print("Enter temperature in Fahrenheit: ");
      double f = sc.nextDouble();
      double c = (f - 32) * 5/9; // Convert Fahrenheit to Celsius
      System.out.println("Temperature in Celsius: " + c);
      sc.close();
   }}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>javac Fahrenheit_Celsius.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>java Fahrenheit_Celsius
Enter temperature in Fahrenheit: 96.8
Temperature in Celsius: 36.0
```

Question 5 : Write a Java program to find area and perimeter of a rectangle.

Source Code :

```
import java.util.Scanner;
public class rectangle {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      System.out.print("Enter the length of the rectangle: ");
      double l = sc.nextDouble();
      System.out.print("Enter the width of the rectangle: ");
      double w = sc.nextDouble();
      double area = l * w;
      double peri = 2 * (l + w);
      System.out.println("Area of the rectangle: " + area);
     System.out.println("Perimeter of the rectangle: " + peri);
      sc.close();
   }}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>javac rectangle.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>java rectangle
Enter the length of the rectangle:
8
Enter the width of the rectangle: 6
Area of the rectangle: 48.0
Perimeter of the rectangle: 28.0
```

Question 6 : Write a Java program to find area and perimeter of a circle.

Source Code :

```
import java.util.Scanner;
public class circle {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      System.out.print("Enter the radius of the circle: ");
      double r = sc.nextDouble();
      double area = Math.PI * r * r;
      double peri = 2 * Math.PI * r;
      System.out.println("Area of the circle: " + area);
      System.out.println("Perimeter of the circle: " + peri);
      sc.close();
```

}}

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>javac circle.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>java circle
Enter the radius of the circle: 21
Area of the circle: 1385.442360233099
Perimeter of the circle: 131.94689145077132
```

Question 7 : Write a Java Program to display whether a number is odd or even.

Source Code :

```
import java.util.Scanner;
public class odd_even {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      System.out.print("Enter a number: ");
      int n = sc.nextInt();
      if (n % 2 == 0) { // Check if the number is odd or even
         System.out.println(n + " is even.");
      } else {
         System.out.println(n + " is odd.");
      }sc.close();
   }}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>javac odd_even.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>java odd_even
Enter a number: 98
98 is even.
```

Question 8 : Write a Java Program to check if a number is Positive or Negative.

Source Code :

```
import java.util.Scanner;
public class positive_negative {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      System.out.print("Enter a number: ");
      int n = sc.nextInt();
      if (n>0) {        // Check if the number is positive or negative
         System.out.println(n + " is positive.");
      } else {
         System.out.println(n + " is negative.");}
      sc.close();
   }}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>javac positive_negative.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>java positive_negative
Enter a number: -34
-34 is negative.
```

Question 9 : . Write a Java program to find maximum of three numbers.

Source Code :

```
import java.util.Scanner;
public class max_three {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      System.out.println("Enter three numbers:"); // taking input of three numbers from user
      System.out.print("1st number: ");
      double num1 = sc.nextDouble();
      System.out.print("2nd number: ");
```

```
        double num2 = sc.nextDouble();
        System.out.print("3rd number: ");
        double num3 = sc.nextDouble();
        double max = num1;
        if (num2 > max) { // find the maximum of the three numbers
            max = num2;
        } if (num3 > max) {
            max = num3;}
        System.out.println("The maximum of the three numbers is: " + max);
        sc.close();
    }}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>javac max_three.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>java max_three
Enter three numbers:
1st number: 87
2nd number: 108
3rd number: 93
The maximum of the three numbers is: 108.0
```

Question 10 : Write a Java program to swap two numbers.

Source Code :

```
import java.util.Scanner;
public class swap{
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter the first number: ");// take input from user
        double num1 = sc.nextDouble();
        System.out.print("Enter the second number: ");
        double num2 = sc.nextDouble();
        num1 = num1 + num2;
        num2 = num1 - num2;
        num1 = num1 - num2;
        System.out.println("After swapping:");
        System.out.println("First number: " + num1);
        System.out.println("Second number: " + num2);
        sc.close();
    }}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>javac swap.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>java swap
Enter the first number: 89
Enter the second number: 65
After swapping:
First number: 65.0
Second number: 89.0
```

Question 11 : Write a Java program to convert miles to kilometers.

Source Code :

```
import java.util.Scanner;
public class miles_kilometers {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter distance in miles: "); // take input from user of distance (in miles)
        double m = sc.nextDouble();
        double km = m * 1.60934; // Convert miles to kilometers
        System.out.println(m + " miles is equal to " + km + " kilometers.");
        sc.close(); }}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>javac miles_kilometers.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>java miles_kilometers
Enter distance in miles: 10
10.0 miles is equal to 16.0934 kilometers.
```

Question 12 : Write a Java program to check whether a year is leap year or not.

Source Code :

```
import java.util.Scanner;
public class leapyear {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      System.out.print("Enter a year: ");
      int year = sc.nextInt();
      if ((year % 4 == 0 && year % 100 != 0) || (year % 400 == 0)) {
         System.out.println(year + " is a leap year."); }
      else {
         System.out.println(year + " is not a leap year."); }
      sc.close(); }}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>javac leapyear.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>java leapyear
Enter a year: 2024
2024 is a leap year.
```

Question 13 : Write a Java program for following grading system. Note: Percentage>=90% ,Grade A Percentage>=80% , Grade B Percentage>=70% , Grade C Percentage>=60% , Grade D Percentage>=40% , Grade E Percentage.

Source Code :

```
import java.util.Scanner;
public class grade {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in); // Create a Scanner object \
      System.out.print("Enter the percentage: "); // take user input of percentage
      double percentage = sc.nextDouble();
      char grade; // Determine the grade based on the percentage
      if (percentage >= 90) {
         grade = 'A';
      } else if (percentage >= 80) {
         grade = 'B';
      } else if (percentage >= 70) {
         grade = 'C';
      } else if (percentage >= 60) {
         grade = 'D';
      } else if (percentage >= 40) {
         grade = 'E';
      } else {
         grade = 'F';
      }
      System.out.println("Grade: " + grade); // Print the grade
      sc.close(); // Close the scanner
   }}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>javac grade.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>java grade
Enter the percentage: 65
Grade: D

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>java grade
Enter the percentage: 89
Grade: B
```

Question 14 : Write a Java program to check weather a number divisible by 5 or not

Source Code :

```
import java.util.Scanner;
public class divisible_by_5 {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      System.out.print("Enter a number: ");
      int n = sc.nextInt();
      // Check if the number is odd or even
      if (n % 5 == 0) {
         System.out.println(n + " is divisible by 5.");
      } else {
         System.out.println(n + " is not divisible by 5.");
      }
      sc.close();
   }}
```

Output :

```
C:\Windows\System32\cmd.exe
Microsoft Windows [Version 10.0.22000.2538]
(c) Microsoft Corporation. All rights reserved.

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>javac divisible_by_5.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>java divisible_by_5
Enter a number: 25
25 is divisible by 5.
```

Week 2

Question 1 : Write a Java program to check whether a number is Buzz or not.

Source Code :

```
import java.util.Scanner;
public class buzz_number {
   public static void main(String[] args) {
       Scanner sc = new Scanner(System.in);  // Create a Scanner object
       System.out.print("Enter a number: ");   // taking user input of a numbe
      int number = sc.nextInt();
      if ((number % 7 == 0) || (number % 10 == 7)) // Print the result {
         System.out.println(number + " is a Buzz number.");
      } else {
         System.out.println(number + " is not a Buzz number.");
      }
      sc.close(); // Close the scanner
   }}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>javac buzz_number.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>java buzz_number
Enter a number: 63
63 is a Buzz number.

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>java buzz_number
Enter a number: 83
83 is not a Buzz number.
```

Question 2 : . Write a Java program to calculate factorial of 12.

Source Code :

```
import java.util.Scanner;
public class factorial {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in); // Create a Scanner object
      System.out.print("Enter a number: ");  // taking user input
      int number = sc.nextInt();
      long factorial = 1;     // Calculate the factorial of the number
      for (int i = 1; i <= number; i++) {
         factorial *= i;
      }
         System.out.println("Factorial of " + number + " is: " + factorial); // Print the factorial
         sc.close();  // Close the scanner
   }}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>javac factorial.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>java factorial
Enter a number: 12
Factorial of 12 is: 479001600
```

Question 3 : Write a Java program for Fibonacci series.

Source Code :

```
import java.util.Scanner;
public class fibonacci {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);        // Create a Scanner object
      System.out.print("Enter the number of terms for Fibonacci series: ");
      int num = sc.nextInt();  // taking range from user
      int prev = 0, curr = 1;   // Generate Fibonacci series
      System.out.println("Fibonacci series:");
      for (int i = 1; i <= num; ++i) {
         System.out.print(prev + " ");
         int next = prev + curr;
         prev = curr;
         curr = next; }
      sc.close();  }}    // Close the scanner
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>javac fibonacci.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>java fibonacci
Enter the number of terms for Fibonacci series: 10
Fibonacci series:
0 1 1 2 3 5 8 13 21 34
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>
```

Question 4 : Write a Java program to reverse a number

Source Code :

```
import java.util.Scanner;
public class reverse {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);          // Create a Scanner
      System.out.print("Enter a number: ");
      int number = sc.nextInt();
      int reverse = 0;            // Reverse the number
      while (number != 0) {
         int digit = number % 10;
         reverse = reverse * 10 + digit;
         number /= 10;
      }
           System.out.println("Reversed number: " + reverse);   // Print the reversed number
          sc.close(); // Close the scanner
```

}}

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>javac reverse.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>java reverse
Enter a number: 298
Reversed number: 892
```

Question 5 : Admission to a professional course is subject to the following conditions: (a) marks in Mathematics >= 60
(b) marks in Physics >=50
(c) marks in Chemistry >=40
(d) Total in all 3 subjects >=200 (Or) Total in Maths & Physics>=150
Given the marks in the 3 subjects of n (user input) students, write a program to process the applications to list the eligible candidates.

Source Code :

```
import java.util.Scanner;
public class professional_course_admission {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      System.out.print("Enter the number of students: ");
      int n = sc.nextInt();   // taking total no of strength from user
     int[] math = new int[n];     // Create arrays to store marks of students in Mathematics,
     int[] phy = new int[n];      // Physics, and Chemistry
     int[] chem = new int[n];
     for (int i = 0; i < n; i++)          // Read marks of each student {
         System.out.println("Enter marks of student " + (i + 1) + ":");
         System.out.print("Mathematics: ");
         math[i] = sc.nextInt();
         System.out.print("Physics: ");
         phy[i] = sc.nextInt();
         System.out.print("Chemistry: ");
         chem[i] = sc.nextInt();}
      sc.close();    // Close the scanner
      System.out.println("List of eligible candidates:"); // Process applications to list eligible candidates
      for (int i = 0; i < n; i++) {
         if (math[i] >= 60 && phy[i] >= 50 && chem[i] >= 40 &&
            (math[i] + phy[i] + chem[i] >= 200 ||
             math[i] + phy[i] >= 150)) {
            System.out.println("Student " + (i + 1));
         }}}}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>javac professional_course_admission.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>java professional_course_admission
Enter the number of students: 5
Enter marks of student 1:
Mathematics: 98
Physics: 87
Chemistry: 67
Enter marks of student 2:
Mathematics: 30
Physics: 50
Chemistry: 40
Enter marks of student 3:
Mathematics: 87
Physics: 90
Chemistry: 67
Enter marks of student 4:
Mathematics: 21
Physics: 44
Chemistry: 67
Enter marks of student 5:
Mathematics: 24
Physics: 65
Chemistry: 90
List of eligible candidates:
Student 1
Student 3
```

Question 6 : Write a Java program to find all roots of a quadratic equation.

Source Code :

```
import java.util.Scanner;
public class quadratic {
   public static void main(String[] args) {
       Scanner sc = new Scanner(System.in);   // Create a Scanner object to read input
      System.out.println("Enter the coefficients of the quadratic equation (a, b, c):");   // Enter coefficients of the equation
      double a = sc.nextDouble();
      double b = sc.nextDouble();
      double c = sc.nextDouble();
      sc.close();          // Close the scanner
      double dis = b * b - 4 * a * c;          // Calculate discriminant
      if (dis > 0)     // Check the nature of roots and calculate roots accordingly {
         double root1 = (-b + Math.sqrt(dis)) / (2 * a);
         double root2 = (-b - Math.sqrt(dis)) / (2 * a);
         System.out.println("Roots are real and different.");
         System.out.println("Root 1 = " + root1);
         System.out.println("Root 2 = " + root2);
      } else if (dis == 0) {
         double root = -b / (2 * a);
         System.out.println("Roots are real and equal.");
         System.out.println("Root = " + root);
      } else {
         double real = -b / (2 * a);
         double imag = Math.sqrt(-dis) / (2 * a);
         System.out.println("Roots are complex and different.");
         System.out.println("Root 1 = " + real + " + " + imag + "i");
         System.out.println("Root 2 = " + real + " - " + imag + "i");
      }}}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>javac quadratic.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>java quadratic
Enter the coefficients of the quadratic equation (a, b, c):
5
9
8
Roots are complex and different.
Root 1 = -0.9 + 0.8888194417315589i
Root 2 = -0.9 - 0.8888194417315589i

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>java quadratic
Enter the coefficients of the quadratic equation (a, b, c):
-9
-8
-6
Roots are complex and different.
Root 1 = -0.4444444444444444 + -0.6849348892187751i
Root 2 = -0.4444444444444444 - -0.6849348892187751i
```

Question 7 : Write a Java program to calculate the sum of natural numbers up to a certain range

Source Code :

```
import java.util.Scanner;
public class sum_natural_numbers {
   public static void main(String[] args) {
          Scanner sc = new Scanner(System.in);  // Create a Scanner object
          System.out.print("Enter the range (up to which natural numbers to sum): ");      // Prompt the user to enter the range
          int range = sc.nextInt();
          sc.close();          // Close the scanner
         int sum = 0;                 // Calculate the sum of natural numbers up to the specified range
         for (int i = 1; i <= range; i++) {
                sum += i;    }
         System.out.println("Sum of natural numbers up to " + range + " is: " + sum);            // Print the sum
   }}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>javac sum_natural_numbers.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>java sum_natural_numbers
Enter the range (up to which natural numbers to sum): 10
Sum of natural numbers up to 10 is: 55
```

Question 8 : Write a Java program to print all multiple of 10 between a given interval.

Source Code :

```
import java.util.Scanner;
public class multiples_of_ten {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      System.out.print("Enter the start of the interval: ");
      int start = sc.nextInt();
      System.out.print("Enter the end of the interval: ");
      int end = sc.nextInt();
      sc.close();
      System.out.println("Multiples of 10 within the interval [" + start + ", " + end + "]:");
      for (int i = start; i <= end; i++) {
         if (i % 10 == 0) {
            System.out.print(i + " ");
         }}}}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>javac multiples_of_ten.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>java multiples_of_ten
Enter the start of the interval: 10
Enter the end of the interval: 50
Multiples of 10 within the interval [10, 50]:
10 20 30 40 50
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>
```

Question 9 : Write a Java program to generate multiplication table.

Source Code :

```
import java.util.Scanner;
public class multiplication_table {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      System.out.print("Enter the number for the multiplication table: ");
      int number = sc.nextInt();
      System.out.print("Enter the range for the multiplication table: ");
      int range = sc.nextInt();
      sc.close();
      System.out.println("Multiplication table for " + number + " up to " + range + ":");
      for (int i = 1; i <= range; i++) {
         System.out.println(number + " x " + i + " = " + (number * i));
      }}}
```

Output :

```
C:\Windows\System32\cmd.exe
Microsoft Windows [Version 10.0.22000.2538]
(c) Microsoft Corporation. All rights reserved.

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>javac multiplication_table.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>java multiplication_table
Enter the number for the multiplication table: 34
Enter the range for the multiplication table: 10
Multiplication table for 34 up to 10:
34 x 1 = 34
34 x 2 = 68
34 x 3 = 102
34 x 4 = 136
34 x 5 = 170
34 x 6 = 204
34 x 7 = 238
34 x 8 = 272
34 x 9 = 306
34 x 10 = 340
```

Question 10 : Write a Java program to find HCF of two Numbers

Source Code :

```
import java.util.Scanner;
public class hcf {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      System.out.print("Enter the first number: ");
      int num1 = sc.nextInt();
      System.out.print("Enter the second number: ");
      int num2 = sc.nextInt();
      sc.close();
      int hcf = findHCF(num1, num2); // Find the HCF using the Euclidean algorithm
      System.out.println("HCF of " + num1 + " and " + num2 + " is: " + hcf);}
   public static int findHCF(int num1, int num2) { // Method to find HCF using the Euclidean algorithm
      while (num2 != 0) {
         int temp = num2;
         num2 = num1 % num2;
         num1 = temp;}
      return num1; }}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>javac hcf.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>java hcf
Enter the first number: 34
Enter the second number: 22
HCF of 34 and 22 is: 2
```

Question 11 : Write a Java program to find LCM of two Numbers.

Source Code :

```
import java.util.Scanner;
public class lcm {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      System.out.print("Enter the first number: ");
      int num1 = sc.nextInt();
      System.out.print("Enter the second number: ");
      int num2 = sc.nextInt();
      sc.close();
      int lcm = (num1 * num2) / findHCF(num1, num2);
      System.out.println("LCM of " + num1 + " and " + num2 + " is: " + lcm);}
   public static int findHCF(int num1, int num2) {  // Method to find HCF using the Euclidean algorithm
      while (num2 != 0) {
         int temp = num2;
         num2 = num1 % num2;
         num1 = temp;}
      return num1;
   }}
```

Output :

```
C:\Windows\System32\cmd.exe
Microsoft Windows [Version 10.0.22000.2538]
(c) Microsoft Corporation. All rights reserved.

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>javac lcm.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>java lcm
Enter the first number: 32
Enter the second number: 24
LCM of 32 and 24 is: 96
```

Question 12 : Write a Java program to count the number of digits of an integer

Source Code :

```
import java.util.Scanner;
public class count_digits {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
```

```
        System.out.print("Enter an integer: ");
        int number = sc.nextInt();
        sc.close();
        int count = 0; // Count the number of digits
        int temp = number;
        while (temp != 0) {
            temp /= 10;
            count++; }
        System.out.println("Number of digits in " + number + " is: " + count);
    }}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>javac count_digits.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>java count_digits
Enter an integer: 3293
Number of digits in 3293 is: 4
```

Question 13 : Write a Java program to calculate the exponential of a number.

Source Code :

```
import java.util.Scanner;
public class exponential {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter the base number: ");
        double base = sc.nextDouble();
        System.out.print("Enter the exponent: ");
        int exponent = sc.nextInt();
        sc.close();
        double result=1 ;
        if (exponent < 0) {
            base = 1 / base;
            exponent = -exponent; }
      for (int i = 0; i < exponent; i++) {
            result *= base; }
        System.out.println(base + " raised to the power " + exponent + " is: " + result);
    }}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>javac exponential.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>java exponential
Enter the base number: 2
Enter the exponent: 3
2.0 raised to the power 3 is: 8.0
```

Question 14 : Write a Java program to check whether a number is palindrome or not.

Source Code :

```
import java.util.Scanner;
public class palindrome {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter a number: ");
        int n = sc.nextInt();
        sc.close();
        // Check if the number is a palindrome
        int ori = n;
        int rev = 0;
        while (n != 0) {
            int digit = n % 10;
            rev = rev * 10 + digit;
            n /= 10; }
        if (ori == rev) {
```

```
            System.out.println("It is a palindrome.");
        } else {
            System.out.println("It is not a palindrome.");
        }}}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>javac palindrome.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>java palindrome
Enter a number: 121
It is a palindrome.

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>java palindrome
Enter a number: 321
It is not a palindrome.
```

Question 15: . Write a Java program to check whether a number is prime or not.

Source Code :

```
import java.util.Scanner;
public class prime {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter a number: ");
        int num = sc.nextInt();
        sc.close(); // Close the scanner
        boolean isPrime = checkPrime(num);// Check if the number is prime
        if (isPrime) {
            System.out.println(num + " is a prime number.");
        } else {
            System.out.println(num + " is not a prime number.");
        }}
    public static boolean checkPrime(int num) { // Method to check if a number is prime
        if (num <= 1) { // 0 and 1 are not prime numbers
            return false;}
        for (int i = 2; i <= Math.sqrt(num); i++) {
            if (num % i == 0) {
                return false;
            }} return true; }}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>javac prime.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>java prime
Enter a number: 87
87 is not a prime number.

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>java prime
Enter a number: 11
11 is a prime number.
```

Question 16 : Write a Java program to convert a Binary Number to Decimal and Decimal to Binary.

Source Code :

```
import java.util.Scanner;
public class binary_decimal {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.println("Choose conversion:");
        System.out.println("1. Binary to Decimal");
        System.out.println("2. Decimal to Binary");
        System.out.print("Enter your choice (1 or 2): ");
        int choice = sc.nextInt();
        switch (choice) { // Perform the conversion based on the choice
            case 1:
                binaryToDecimal();
                break;
            case 2:
```

```
            decimalToBinary();
            break;
         default:
            System.out.println("Invalid choice. Please enter 1 or 2."); }
      sc.close(); }
   public static void binaryToDecimal() { // Method to convert binary to decimal
      Scanner sc = new Scanner(System.in);
      System.out.print("Enter a binary number: ");
      String binaryString = sc.nextLine();
      sc.close();
      int decimal = Integer.parseInt(binaryString, 2); // Convert binary string to decimal
      System.out.println("Decimal equivalent: " + decimal); // Print the decimal equivalent
   }
   public static void decimalToBinary() { // Method to convert decimal to binary
      Scanner sc = new Scanner(System.in);
      System.out.print("Enter a decimal number: ");
      int decimal = sc.nextInt();
      sc.close();
      String binaryString = Integer.toBinaryString(decimal);// Convert decimal to binary string
      System.out.println("Binary equivalent: " + binaryString);// Print the binary equivalent
   }}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>javac binary_decimal.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>java binary_decimal
Choose conversion:
1. Binary to Decimal
2. Decimal to Binary
Enter your choice (1 or 2): 1
Enter a binary number: 100
Decimal equivalent: 4

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>java binary_decimal
Choose conversion:
1. Binary to Decimal
2. Decimal to Binary
Enter your choice (1 or 2): 2
Enter a decimal number: 4
Binary equivalent: 100
```

Question 17 : Write a Java program to find median of a set of numbers.

Source Code :

```
import java.util.Scanner;
public class median {
   public static void main(String[] args) {
      Scanner scanner = new Scanner(System.in);
      System.out.print("Enter the number of elements: ");
      int n = scanner.nextInt();
      int[] numbers = new int[n];  // Create an array to store the elements
      System.out.println("Enter the elements:");
      for (int i = 0; i < n; i++) {
         numbers[i] = scanner.nextInt();
      }
      sort(numbers); // Sort the array in ascending order
      double median;
      if (n % 2 == 0) {
         median = (double) (numbers[n / 2 - 1] + numbers[n / 2]) / 2;
      } else {
         median = numbers[n / 2];}
      System.out.println("Median: " + median);
                        scanner.close();// Close the scanner
   }
   public static void sort(int[] arr) { // Method to perform selection sort
      int n = arr.length;
      for (int i = 0; i < n - 1; i++) {
```

```
        int minIndex = i;
        for (int j = i + 1; j < n; j++) {
            if (arr[j] < arr[minIndex]) {
                minIndex = j;
            }}
        int temp = arr[minIndex];
        arr[minIndex] = arr[i];
        arr[i] = temp;
    }}}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>javac median.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>java median
Enter the number of elements: 5
Enter the elements:
24
65
33
78
44
Median: 44.0
```

Question 18 : Write a program to compute the value of Euler's number that is used as the base of natural logarithms. Use the following formula. e= 1+ 1/1! +1 /2! + 1/3+..... 1/n!

Source Code :

```
public class euler {
    public static void main(String[] args) {
        int n = 10; // You can change the value of n to adjust the accuracy
        double e = 1.0;
        double factorial = 1.0;
        for (int i = 1; i <= n; i++) {
            factorial *= i;
            e += 1.0 / factorial;}
        System.out.println("The value of Euler's number (e) is: " + e);
    }}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>javac euler.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>java euler
The value of Euler's number (e) is: 2.7182818011463845
```

Question 19 : Write a Java program to generate all combination of 1, 2, or 3 using loop.

Source Code :

```
public class combination {
    public static void main(String[] args) {
        int[] nums = {1, 2, 3};
        System.out.println("All combinations:");
        for (int i = 0; i < nums.length; i++) {
            System.out.println(nums[i]);
            for (int j = i + 1; j < nums.length; j++) {
                System.out.println(nums[i] + " " + nums[j]);
                for (int k = j + 1; k < nums.length; k++) {
                    System.out.println(nums[i] + " " + nums[j] + " " + nums[k]);
                                                    }}}}}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>javac combination.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>java combination
All combinations:
1
1 2
1 2 3
1 3
2
2 3
3
```

Question 20 : Write a Java program to read two integer values m and n and to and print whether m is multiple of n.

Source Code :

```
import java.util.Scanner;
public class multiple {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      System.out.print("Enter the value of m: ");
      int m = sc.nextInt();
      System.out.print("Enter the value of n: ");
      int n = sc.nextInt();
      if (m % n == 0) {        // Check if m is a multiple of n
         System.out.println(m + " is a multiple of " + n);
      } else {
         System.out.println(m + " is not a multiple of " + n);}
      sc.close();
   }}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>javac multiple.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>java multiple
Enter the value of m: 30
Enter the value of n: 10
30 is a multiple of 10
```

Question 21 : . Write a Java program to display prime numbers between a given interval.

Source Code :

```
import java.util.Scanner;
public class prime_range {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      System.out.print("Enter the starting number of the interval: ");
      int start = sc.nextInt();
      System.out.print("Enter the ending number of the interval: ");
      int end = sc.nextInt();
      System.out.println("Prime numbers between " + start + " and " + end + ":");
      for (int i = start; i <= end; i++) { // Iterate through the interval and check for prime numbers
         if (isPrime(i)) {
            System.out.println(i); }}
      sc.close();}
   public static boolean isPrime(int num) {    // Method to check if a number is prime
        if (num <= 1) {
         return false;
      }
      for (int i = 2; i <= Math.sqrt(num); i++) {
         if (num % i == 0) {
            return false; }
      }return true; }}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>javac prime_range.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>java prime_range
Enter the starting number of the interval: 10
Enter the ending number of the interval: 40
Prime numbers between 10 and 40:
11
13
17
19
23
29
31
37
```

Question 22 : . Write a Java program to check whether a given number is Armstrong Number or not.

Source Code :

```
import java.util.Scanner;
public class armstrong {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      System.out.print("Enter a number: ");
      int num = sc.nextInt();
      int ori, rem, result = 0, n = 0;
      ori = num;
      for (ori = num; ori != 0; ori /= 10) {
         ++n; }
      ori = num;
      while (ori != 0) {         // Calculate result
         rem = ori % 10;
         result += Math.pow(rem, n);
         ori /= 10; }
      if (result == num) {  // Check if the number is Armstrong
         System.out.println(num + " is an Armstrong number.");
      } else {
         System.out.println(num + " is not an Armstrong number.");
      }sc.close();}}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>javac armstrong.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>java armstrong
Enter a number: 153
153 is an Armstrong number.

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\uem_java\uem>java armstrong
Enter a number: 152
152 is not an Armstrong number.
```

WEEK 3

Question 1 : Write a Java program to calculate Sum & Average of an integer array.

Source Code :

```
import java.util.Scanner;
public class sum_average_array {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      System.out.print("Enter the number of elements in the array: ");
      int size = sc.nextInt();
      int[] array = new int[size]; // Declare an array of the given size
      System.out.println("Enter the elements of the array:");
      for (int i = 0; i < size; i++) {
         System.out.print("Element " + (i + 1) + ": ");
         array[i] = sc.nextInt(); }
      int sum = 0; // Calculate sum
      for (int num : array) {
         sum += num;        }
      double average = (double) sum / size;  // Calculate average
      System.out.println("Sum: " + sum); // Display sum and average
      System.out.println("Average: " + average);
      sc.close(); }}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>javac sum_average_array.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>java sum_average_array
Enter the number of elements in the array: 5
Enter the elements of the array:
Element 1: 20
Element 2: 10
Element 3: 30
Element 4: 40
Element 5: 50
Sum: 150
Average: 30.0
```

Question 2 : Write a Java program to implement stack using array.

Source Code :

```
import java.util.Scanner;
public class stack {
   private static final int MAX_SIZE = 100;
   private static int[] stack = new int[MAX_SIZE];
   private static int top = -1;
   public static void push(int value) {
      if (top == MAX_SIZE - 1) {
         System.out.println("Stack Overflow. Cannot push element.");
      } else {
         stack[++top] = value;
         System.out.println(value + " pushed into the stack.");
      }}
   public static void pop() {
      if (top == -1) {
         System.out.println("Stack Underflow. Cannot pop element.");
      } else {
         System.out.println("Popped element: " + stack[top--]); }}
   public static int topElement() {
      if (top == -1) {
         System.out.println("Stack is empty.");
         return -1;
      } else {
         return stack[top]; }}
   public static void display() {
      if (top == -1) {
         System.out.println("Stack is empty.");
      } else {
         System.out.print("Stack elements: ");
         for (int i = 0; i <= top; i++) {
            System.out.print(stack[i] + " ");}
         System.out.println(); }}
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      int choice, element;
      do {
         System.out.println("\nStack Operations Menu:");
         System.out.println("1. Push");
         System.out.println("2. Pop");
         System.out.println("3. Get Top Element");
         System.out.println("4. Display Stack");
         System.out.println("5. Exit");
         System.out.print("Enter your choice: ");
         choice = sc.nextInt();
         switch (choice) {
            case 1:
               System.out.print("Enter element to push: ");
               element = sc.nextInt();
               push(element);
               break;
            case 2:
               pop();
```

```
                break;
            case 3:
                element = topElement();
                if (element != -1) {
                    System.out.println("Top element: " + element);
                }
                break;
            case 4:
                display();
                break;
            case 5:
                System.out.println("Exiting program. Goodbye!");
                break;
            default:
                System.out.println("Invalid choice. Please enter a valid option.");
        }
    } while (choice != 5);
    sc.close();
}}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>java stack

Stack Operations Menu:
1. Push
2. Pop
3. Get Top Element
4. Display Stack
5. Exit
Enter your choice: 1
Enter element to push: 2
2 pushed into the stack.

Stack Operations Menu:
1. Push
2. Pop
3. Get Top Element
4. Display Stack
5. Exit
Enter your choice: 1
Enter element to push: 3
3 pushed into the stack.

Stack Operations Menu:
1. Push
2. Pop
3. Get Top Element
4. Display Stack
5. Exit
Enter your choice: 1
Enter element to push: 4
4 pushed into the stack.

Stack Operations Menu:
1. Push
2. Pop
3. Get Top Element
4. Display Stack
5. Exit
Enter your choice: 4
Stack elements: 2 3 4

Stack Operations Menu:
1. Push
2. Pop
3. Get Top Element
4. Display Stack
5. Exit
Enter your choice: 2
Popped element: 4

Stack Operations Menu:
1. Push
2. Pop
3. Get Top Element
4. Display Stack
5. Exit
Enter your choice: 4
Stack elements: 2 3
```

```
Stack Operations Menu:
1. Push
2. Pop
3. Get Top Element
4. Display Stack
5. Exit
Enter your choice: 3
Top element: 3
```

Question 3 : Write a Java program to implement Queue using array

Source Code :

```
import java.util.Scanner;
public class queue {
   private static final int MAX = 10;
   private static int[] queue = new int[MAX];
   private static int front = -1, rear = -1;
   public static void enqueue(int element) {
      if (rear == MAX - 1) {
         System.out.println("Queue is full. Cannot enqueue.");
      } else {
         if (front == -1) {
            front = 0;
         }
         rear++;
         queue[rear] = element;
         System.out.println(element + " has been enqueued."); }}
   public static void dequeue() {
        if (front == -1) {
         System.out.println("Queue is empty. Cannot dequeue.");
      } else {
         System.out.println(queue[front] + " has been dequeued.");
            if (front == rear) {
                front = rear = -1;
         } else {
            front++;
         }}}
   public static int peek() {
      if (front == -1) {
         System.out.println("Queue is empty. No front element to peek.");
         return -1;  // Return an error value
      } else {
         return queue[front];
      }}
   public static void display() {
      if (front == -1) {
         System.out.println("Queue is empty.");
      } else {
         System.out.print("Queue elements: ");
         for (int i = front; i <= rear; i++) {
            System.out.print(queue[i] + " ");}
         System.out.println(); }}
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      int choice, element;
         System.out.println("\nMenu:");
         System.out.println("1. Enqueue");
         System.out.println("2. Dequeue");
         System.out.println("3. Peek");
         System.out.println("4. Display");
         System.out.println("5. Exit");
       while (true) {
         System.out.print("Enter your choice: ");
         choice = sc.nextInt();
         switch (choice) {
            case 1:
               System.out.print("Enter element to enqueue: ");
               element = sc.nextInt();
               enqueue(element);
               break;
            case 2:
               dequeue();
               break;
            case 3:
```

```
                element = peek();
                if (element != -1) {
                    System.out.println("Front element: " + element);
                }
                break;
            case 4:
                display();
                break;
            case 5:
                sc.close();
                System.exit(0);
            default:
                System.out.println("Invalid choice. Please try again.");
        }}}}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>javac queue.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>java queue

Menu:
1. Enqueue
2. Dequeue
3. Peek
4. Display
5. Exit
Enter your choice: 1
Enter element to enqueue: 2
2 has been enqueued.
Enter your choice: 1
Enter element to enqueue: 3
3 has been enqueued.
Enter your choice: 1
Enter element to enqueue: 4
4 has been enqueued.
Enter your choice: 4
Queue elements: 2 3 4
Enter your choice: 3
Front element: 2
Enter your choice: 2
2 has been dequeued.
Enter your choice: 4
Queue elements: 3 4
Enter your choice: 5
```

Question 4 : Write a Java program to calculate Sum of two 2-dimensional arrays.

Source Code :

```
import java.util.Scanner;
public class sum_2D_array {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.print("Enter the number of rows for the arrays: ");
        int rows = scanner.nextInt();
        System.out.print("Enter the number of columns for the arrays: ");
        int cols = scanner.nextInt();
        // Initialize arrays
        int[][] array1 = new int[rows][cols];
        int[][] array2 = new int[rows][cols];
        int[][] sum= new int[rows][cols];
        System.out.println("Enter elements for the first array:");
                        for (int i = 0; i < array1.length; i++) {
            for (int j = 0; j < array1[0].length; j++) {
                System.out.print("Enter element at position [" + i + "][" + j + "]: ");
                array1[i][j] = scanner.nextInt();
            }}
        System.out.println("Enter elements for the second array:");
        for (int i = 0; i < array2.length; i++) {
            for (int j = 0; j < array2[0].length; j++) {
                System.out.print("Enter element at position [" + i + "][" + j + "]: ");
                array2[i][j] = scanner.nextInt();
```

```
        }}
      for (int i = 0; i < rows; i++) { // Calculate sum
         for (int j = 0; j < cols; j++) {
            sum[i][j] = array1[i][j] + array2[i][j];
         }}
      System.out.println("Sum of the two arrays:");
     for (int i = 0; i < sum.length; i++) {
         for (int j = 0; j < sum[0].length; j++) {
            System.out.print(sum[i][j] + "\t");
         }System.out.println();}
      scanner.close();  }}
```

Output :

```
Microsoft Windows [Version 10.0.22000.2538]
(c) Microsoft Corporation. All rights reserved.

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>javac sum_2D_array.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>java sum_2D_array
Enter the number of rows for the arrays: 2
Enter the number of columns for the arrays: 2
Enter elements for the first array:
Enter element at position [0][0]: 5
Enter element at position [0][1]: 4
Enter element at position [1][0]: 3
Enter element at position [1][1]: 2
Enter elements for the second array:
Enter element at position [0][0]: 9
Enter element at position [0][1]: 8
Enter element at position [1][0]: 7
Enter element at position [1][1]: 6
Sum of the two arrays:
14      12
10      8
```

Question 5 : Write a Java program to find the range of a 1D array.

Source Code :

```
import java.util.Scanner;
public class range_array {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      System.out.print("Enter the size of the array: "); // Input the size of the array
      int size = sc.nextInt();
      int[] array = new int[size];
      System.out.println("Enter the elements of the array:");
      for (int i = 0; i < size; i++) {
         System.out.print("Element " + (i + 1) + ": ");
         array[i] = sc.nextInt();}
      int min = array[0];
      int max = array[0];
      for (int i = 1; i < size; i++) {
         if (array[i] < min) {
            min = array[i];  }
         if (array[i] > max) {
            max = array[i];  }}
      int range = max - min;
      System.out.println("Range of the array: " + range);
      sc.close();
   }}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>javac range_array.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>java range_array
Enter the size of the array: 4
Enter the elements of the array:
Element 1: 2
Element 2: 3
Element 3: 4
Element 4: 5
Range of the array: 3
```

Question 6 : Write a Java program to search an element in an array.

Source Code :

```
import java.util.Scanner;
public class linear_search {
   public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
      System.out.print("Enter the size of the array: ");
      int size = sc.nextInt();
      int[] array = new int[size]; // Declare the array
      System.out.println("Enter the elements of the array:");
      for (int i = 0; i < size; i++) {
         System.out.print("Element " + (i + 1) + ": ");
         array[i] = sc.nextInt(); }
      System.out.print("Enter the element to search: "); // Input the element to be searched
      int target = sc.nextInt();
      int index = linearSearch(array, target); // Perform linear search
      if (index != -1) {
         System.out.println("Element " + target + " found at index " + index);
      } else {
         System.out.println("Element " + target + " not found in the array");
      }sc.close();}
   public static int linearSearch(int[] array, int target) {  // Method to perform search
      for (int i = 0; i < array.length; i++) {
         if (array[i] == target) {
            return i; // Return the index where the element is found
         }}
      return -1; // Return -1 if element is not found
   }}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>java linear_search
Enter the size of the array: 4
Enter the elements of the array:
Element 1: 1
Element 2: 2
Element 3: 3
Element 4: 4
Enter the element to search: 3
Element 3 found at index 2
```

Question 7 : Write a Java program to find the sum of even numbers in an integer array.

Source Code :

```
import java.util.Scanner;
public class sum_even_numbers_array {
   public static void main(String[] args) {
      Scanner sc= new Scanner(System.in);
      System.out.print("Enter the size of the array: ");
      int size = sc.nextInt();
      int[] array = new int[size];
      // Input elements into the array
      System.out.println("Enter the elements of the array:");
      for (int i = 0; i < size; i++) {
         System.out.print("Element " + (i + 1) + ": ");
         array[i] = sc.nextInt(); }
      int sum = 0;
      for (int num : array) {
         if (num % 2 == 0) {
            sum += num;
         }}
      System.out.println("Sum of even numbers in the array: " + sum);
      sc.close();
    }}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>java sum_even_numbers_array
Enter the size of the array: 5
Enter the elements of the array:
Element 1: 1
Element 2: 2
Element 3: 3
Element 4: 4
Element 5: 6
Sum of even numbers in the array: 12
```

Question 8 : Write a Java program to find the sum of diagonal elements in a 2D array

Source Code :

```
import java.util.Scanner;
public class sum_diagonals {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      System.out.print("Enter the size of the square matrix: ");
      int size = sc.nextInt();
      int[][] matrix = new int[size][size];
      // Input elements into the matrix
      System.out.println("Enter the elements of the square matrix:");
      for (int i = 0; i < size; i++) {
         for (int j = 0; j < size; j++) {
            System.out.print("Element at position [" + i + "][" + j + "]: ");
            matrix[i][j] = sc.nextInt(); }}
      int sum = 0;
      for (int i = 0; i < size; i++) {
         sum += matrix[i][i]; // Add elements from the main diagonal}
      System.out.println("Sum of diagonal elements: " + sum);
      sc.close();
   }}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>javac sum_diagonals.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>java sum_diagonals
Enter the size of the square matrix: 2
Enter the elements of the square matrix:
Element at position [0][0]: 6
Element at position [0][1]: 7
Element at position [1][0]: 9
Element at position [1][1]: 8
Sum of diagonal elements: 14
```

Question 9 : Reverse the elements in an array of integers without using a second array.

Source Code :

```
import java.util.Scanner;
public class reverse_array {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      System.out.print("Enter the size of the array: ");
      int size = sc.nextInt();
      int[] array = new int[size];
      // Input elements into the array
      System.out.println("Enter the elements of the array:");
      for (int i = 0; i < size; i++) {
         System.out.print("Element " + (i + 1) + ": ");
         array[i] = sc.nextInt();
      }
      reverseArray(array); // Reverse the array
      System.out.println("Reversed array:"); // Display the reversed array
      for (int num : array) {
         System.out.print(num + " ");
```

```
        }sc.close(); }
    public static void reverseArray(int[] array) {
        int start = 0;
        int end = array.length - 1;
        while (start < end) {
            int temp = array[start];
            array[start] = array[end];
            array[end] = temp;
            start++;
            end--;
        }}}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>javac reverse_array.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>java reverse_array
Enter the size of the array: 5
Enter the elements of the array:
Element 1: 1
Element 2: 2
Element 3: 3
Element 4: 4
Element 5: 5
Reversed array:
5 4 3 2 1
```

Question 10 : Write a Java program to enter n elements in an array and find smallest number among them

Source Code :

```
import java.util.Scanner;
public class min_array {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter the number of elements in the array: ");
        int n = sc.nextInt();
        int[] array = new int[n];
        System.out.println("Enter the elements of the array:");
        for (int i = 0; i < n; i++) {
            System.out.print("Element " + (i + 1) + ": ");
            array[i] = sc.nextInt(); }
        int min = array[0];
        for (int i = 1; i < n; i++) { // Find the smallest number in the array
            if (array[i] < min) {
                min = array[i];
            }}
        System.out.println("The smallest number in the array is: " + min);
        sc.close();
    }}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>javac min_array.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>java min_array
Enter the number of elements in the array: 5
Enter the elements of the array:
Element 1: 43
Element 2: 2
Element 3: 15
Element 4: 54
Element 5: 31
The smallest number in the array is: 2
```

Question 11 : . Write Java program to find the sum of all odd numbers in a 2D array.

Source Code :

```
import java.util.Scanner;
public class sum_odd_numbers_matrix {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter the number of rows: ");
```

```
        int rows = sc.nextInt();
        System.out.print("Enter the number of columns: ");
        int cols = sc.nextInt();
        int[][] array = new int[rows][cols];
        System.out.println("Enter the elements of the array:");
        for (int i = 0; i < rows; i++) {
            for (int j = 0; j < cols; j++) {
                array[i][j] = sc.nextInt(); }}
        int sum = 0;
        for (int i = 0; i < rows; i++) {
            for (int j = 0; j < cols; j++) {
                if (array[i][j] % 2 != 0) {
                    sum += array[i][j];
                }} }
        System.out.println("Sum of odd numbers in the 2D array: " + sum);
        sc.close();}}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>javac sum_odd_numbers_matrix.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>java sum_odd_numbers_matrix
Enter the number of rows: 3
Enter the number of columns: 3
Enter the elements of the array:
1
2
3
4
5
6
7
8
9
Sum of odd numbers in the 2D array: 25
```

Question 12 : . Write a Java program to print transpose of matrix.

Source Code :

```
import java.util.Scanner;
public class transpose_matrix {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter the number of rows: ");
        int rows = sc.nextInt();
        System.out.print("Enter the number of columns: ");
        int cols = sc.nextInt();
        int[][] matrix = new int[rows][cols];
        System.out.println("Enter the elements of the matrix:");
        for (int i = 0; i < rows; i++) {
            for (int j = 0; j < cols; j++) {
                matrix[i][j] = sc.nextInt(); }}
        int[][] transpose = new int[cols][rows];
        for (int i = 0; i < cols; i++) {
            for (int j = 0; j < rows; j++) {
                transpose[i][j] = matrix[j][i]; }}
        System.out.println("Transpose of the matrix:");
        for (int i = 0; i < cols; i++) {
            for (int j = 0; j < rows; j++) {
                System.out.print(transpose[i][j] + " "); }
            System.out.println();
        }sc.close();
    } }
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>javac transpose_matrix.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>java transpose_matrix
Enter the number of rows: 3
Enter the number of columns: 3
Enter the elements of the matrix:
1
2
3
4
5
6
7
8
9
Transpose of the matrix:
1 4 7
2 5 8
3 6 9
```

Question 13 : . Write a Java program to check whether a given matrix is sparse or not.

Source Code :

```
import java.util.Scanner;
public class sparse_matrix{
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      System.out.print("Enter the number of rows: ");
      int rows = sc.nextInt();
      System.out.print("Enter the number of columns: ");
      int cols = sc.nextInt();
      int[][] matrix = new int[rows][cols];
      System.out.println("Enter the elements of the matrix:");
      for (int i = 0; i < rows; i++) {
         for (int j = 0; j < cols; j++) {
            matrix[i][j] = sc.nextInt();}}
      int zero = 0;
      for (int i = 0; i < rows; i++) {
         for (int j = 0; j < cols; j++) {
            if (matrix[i][j] == 0) {
               zero++; }}}
      double ratio = (double) zero / (rows * cols);
      if (ratio > 0.5) { // If more than 50% of elements are zero
         System.out.println("The matrix is sparse.");
      } else {
         System.out.println("The matrix is not sparse.");
      }sc.close();}}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>java sparse_matrix
Enter the number of rows: 3
Enter the number of columns: 3
Enter the elements of the matrix:
4
0
0
21
5
0
0
0
65
The matrix is sparse.
```

Question 14 : . Write a Java program to count the prime numbers in an array.

Source Code :

```
import java.util.Scanner;
public class count_prime_array {
   static boolean isPrime(int num) { // Function to check if a number is prime
      if (num <= 1) {
         return false;
      }
```

```
        for (int i = 2; i * i <= num; i++) {
            if (num % i == 0) {
                return false; }}
        return true;}
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter the size of the array: ");
        int size = sc.nextInt();
        int[] arr = new int[size]; // Input the elements of the array
        System.out.println("Enter the elements of the array:");
        for (int i = 0; i < size; i++) {
            arr[i] = sc.nextInt();
        }
        int c = 0; // Count prime numbers in the array
        for (int i = 0; i < size; i++) {
            if (isPrime(arr[i])) {
                c++;}}
        System.out.println("Number of prime numbers in the array: " +c);
        sc.close();}}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>javac count_prime_array.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>java count_prime_array
Enter the size of the array: 5
Enter the elements of the array:
1
2
3
4
5
Number of prime numbers in the array: 3
```

Question 15 : . Write a Java program to find second highest element of an array

Source Code :

```
import java.util.*;
class second_max {
        static void sec_max(Integer arr[], int arr_size){
                Arrays.sort(arr, Collections.reverseOrder()); // Sort the array in descending order
                for (int i = 1; i < arr_size; i++) {
                        if (arr[i] != arr[0]) {
                                System.out.printf("The second largest "+ "element is %d\n",arr[i]);
                                return;}}
                System.out.printf("There is no second "+ "largest element\n");}
        public static void main(String[] args){
                Scanner sc=new Scanner(System.in);
    System.out.print("Enter the size of the array: ");  // Input the size of the array
    int n = sc.nextInt();
    Integer[] arr = new Integer[n];
    System.out.println("Enter the elements of the array:");
    for (int i = 0; i < n; i++) {
        arr[i] = sc.nextInt();
    }sec_max(arr, n);}}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>javac second_max.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>java second_max
Enter the size of the array: 5
Enter the elements of the array:
32
1
54
43
65
The second largest element is 54
```

Question 16 : . Write a Java program which counts the non-zero elements in an integer array

Source Code :

```
import java.util.Scanner;
public class count_non_zero_elements_array {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      System.out.print("Enter the size of the array: ");
      int size = sc.nextInt();
      int[] arr = new int[size]; // Input the elements of the array
      System.out.println("Enter the elements of the array:");
      for (int i = 0; i < size; i++) {
         arr[i] = sc.nextInt();}
      int c = 0;
      for (int i = 0; i < size; i++) {
         if (arr[i] != 0) {
           c++; }}
      System.out.println("Number of non-zero elements in the array: " + c);
      sc.close();}}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>javac count_non_zero_elements_array.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>java count_non_zero_elements_array
Enter the size of the array: 5
Enter the elements of the array:
1
0
2
3
0
Number of non-zero elements in the array: 3
```

Question 17 : . Write a Java program to merge two float arrays.

Source Code :

```
import java.util.Scanner;
public class merge_array {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      System.out.print("Enter the size of the first array: ");
      int size1 = sc.nextInt();
      float[] arr1 = new float[size1];
      System.out.println("Enter the elements of the first array:");
      for (int i = 0; i < size1; i++) {
         arr1[i] = sc.nextFloat(); }
      System.out.print("Enter the size of the second array: ");
      int size2 = sc.nextInt();
      float[] arr2 = new float[size2];
      System.out.println("Enter the elements of the second array:");
      for (int i = 0; i < size2; i++) {
         arr2[i] = sc.nextFloat();    }
      float[] mergedArray = mergeArrays(arr1, arr2);
      System.out.println("Merged array:");
      for (float num : mergedArray) {
         System.out.print(num + " ");}
      sc.close(); }
    public static float[] mergeArrays(float[] arr1, float[] arr2) {
      int size1 = arr1.length;
      int size2 = arr2.length;
      float[] mergedArray = new float[size1 + size2];
      for (int i = 0; i < size1; i++) {
         mergedArray[i] = arr1[i];
        }
      for (int i = 0; i < size2; i++) {
         mergedArray[size1 + i] = arr2[i];
```

```
}return mergedArray; }}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>javac merge_array.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>java merge_array
Enter the size of the first array: 3
Enter the elements of the first array:
2.5
3.6
4.3
Enter the size of the second array: 3
Enter the elements of the second array:
1.4
2.5
8.6
Merged array:
2.5 3.6 4.3 1.4 2.5 8.6
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>S
```

Question 18 : . Write a Java program where elements of two integer arrays get added index wise and get stored into a third array.

Source Code :

```
import java.util.Scanner;
public class add_array {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      System.out.print("Enter the size of the arrays: ");
      int size = sc.nextInt();
      int[] arr1 = new int[size]; // Input the elements of the first array
      System.out.println("Enter the elements of the first array:");
      for (int i = 0; i < size; i++) {
         arr1[i] = sc.nextInt();     }
      int[] arr2 = new int[size];  // Input the elements of the second array
      System.out.println("Enter the elements of the second array:");
      for (int i = 0; i < size; i++) {
         arr2[i] = sc.nextInt();     }
      int[] resultArray = new int[size]; // Add the elements index-wise and store into a third array
      for (int i = 0; i < size; i++) {
         resultArray[i] = arr1[i] + arr2[i];}
      System.out.println("Result array:");
      for (int num : resultArray) {
         System.out.print(num + " ");
      }sc.close();}}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>javac add_array.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>java add_array
Enter the size of the arrays: 5
Enter the elements of the first array:
5
8
2
1
7
Enter the elements of the second array:
3
9
5
7
1
Result array:
8 17 7 8 8
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>
```

Question 19 : . Write a Java program to multiply two matrices.

Source Code :

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

```
public class multiply_matrix {
   public static void main(String[] args) {
      Scanner sc= new Scanner(System.in);
      System.out.print("Enter the number of rows of the first matrix: ");
      int rows1 = sc.nextInt();
      System.out.print("Enter the number of columns of the first matrix: ");
      int cols1 = sc.nextInt();
      System.out.print("Enter the number of rows of the second matrix: ");
      int rows2 = sc.nextInt();
      System.out.print("Enter the number of columns of the second matrix: ");
      int cols2 = sc.nextInt();
      if (cols1 != rows2) { // Check if matrix multiplication is possible
         System.out.println("Matrix multiplication is not possible.");
         return;}
      int[][] matrix1 = new int[rows1][cols1]; // Input elements of the first matrix
      System.out.println("Enter the elements of the first matrix:");
      for (int i = 0; i < rows1; i++) {
         for (int j = 0; j < cols1; j++) {
            matrix1[i][j] = sc.nextInt();
         }}
      int[][] matrix2 = new int[rows2][cols2]; // Input elements of the second matrix
      System.out.println("Enter the elements of the second matrix:");
      for (int i = 0; i < rows2; i++) {
         for (int j = 0; j < cols2; j++) {
            matrix2[i][j] = sc.nextInt();
         }}
      int[][] result = multiply(matrix1, matrix2);
      System.out.println("Resultant matrix after multiplication:");
      for (int i = 0; i < rows1; i++) {
         for (int j = 0; j < cols2; j++) {
            System.out.print(result[i][j] + " ");
         }System.out.println();
      }sc.close();}
   public static int[][] multiply(int[][] matrix1, int[][] matrix2) {
      int rows1 = matrix1.length;
      int cols1 = matrix1[0].length;
      int rows2 = matrix2.length;
      int cols2 = matrix2[0].length;
      int[][] result = new int[rows1][cols2];
      for (int i = 0; i < rows1; i++) {
         for (int j = 0; j < cols2; j++) {
            for (int k = 0; k < cols1; k++) {
               result[i][j] += matrix1[i][k] * matrix2[k][j];
            }}}return result;}}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>javac multiply_matrix.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>java multiply_matrix
Enter the number of rows of the first matrix: 2
Enter the number of columns of the first matrix: 2
Enter the number of rows of the second matrix: 2
Enter the number of columns of the second matrix: 2
Enter the elements of the first matrix:
4
5
6
7
Enter the elements of the second matrix:
8
9
4
2
Resultant matrix after multiplication:
52 46
76 68
```

Question 20 : . Write a Java program to subtract two matrices

Source Code :

```
import java.util.Scanner;
public class subtract_matrix {
   public static void main(String[] args) {
      Scanner sc= new Scanner(System.in);
      System.out.print("Enter the number of rows of the matrices: ");
      int rows = sc.nextInt();
      System.out.print("Enter the number of columns of the matrices: ");
      int cols = sc.nextInt();
      int[][] matrix1 = new int[rows][cols];  // Input elements of the first matrix
      System.out.println("Enter the elements of the first matrix:");
      for (int i = 0; i < rows; i++) {
         for (int j = 0; j < cols; j++) {
            matrix1[i][j] = sc.nextInt();}}
      int[][] matrix2 = new int[rows][cols]; // Input elements of the second matrix
      System.out.println("Enter the elements of the second matrix:");
      for (int i = 0; i < rows; i++) {
         for (int j = 0; j < cols; j++) {
            matrix2[i][j] = sc.nextInt();}}
      int[][] result = subtract(matrix1, matrix2); // Subtract matrices
      System.out.println("Resultant matrix after subtraction:");
      for (int i = 0; i < rows; i++) {
         for (int j = 0; j < cols; j++) {
            System.out.print(result[i][j] + " ");
         }System.out.println();
      }sc.close();}
   public static int[][] subtract(int[][] matrix1, int[][] matrix2) {
      int rows = matrix1.length;
      int cols = matrix1[0].length;
      int[][] result = new int[rows][cols];
      for (int i = 0; i < rows; i++) {
         for (int j = 0; j < cols; j++) {
            result[i][j] = matrix1[i][j] - matrix2[i][j];
         }
      }return result;}}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>javac subtract_matrix.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>java subtract_matrix
Enter the number of rows of the matrices: 2
Enter the number of columns of the matrices: 2
Enter the elements of the first matrix:
8
3
5
2
Enter the elements of the second matrix:
7
5
3
9
Resultant matrix after subtraction:
1 -2
2 -7
```

Question 21 : Write a Java program to find duplicate elements in a 1D array and find their frequency of occurrence

Source Code :

```
import java.util.*;
public class duplicates_frequency_array{
  public static void main(String[] args) {
      Scanner sc=new Scanner(System.in);
      System.out.print("Enter the size of the array: ");
      int n = sc.nextInt();
      int[] array = new int[n];// Input the elements of the array
      System.out.println("Enter the elements of the array:");
      for (int i = 0; i < n; i++) {
         array[i] = sc.nextInt();}
```

```
    Arrays.sort(array);
    int i,j,frequency; //declaring the variables
    System.out.println("These elements are repeated along with its frequency-");
    for(i=0; i<array.length; i++){ //loop for logic implementation
      frequency = 1;
      for(j=i+1; j<array.length; j++){
        if(array[j] == array[i]){
          frequency++;
        } else {
          break;}}
      i=j-1;
      if(frequency > 1){
        System.out.println(array[i] + " --> " + frequency);
      }}}}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>javac duplicates_frequency_array.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>java duplicates_frequency_array
Enter the size of the array: 5
Enter the elements of the array:
1
21
1
4
4
These elements are repeated along with its frequency-
1 --> 2
4 --> 2
```

Question 22 : . Write a Java program to print every alternate number of a given array.

Source Code :

```
import java.util.Scanner;
public class alternate_number_array {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      System.out.print("Enter the size of the array: "); // Input the size of the array
      int size = sc.nextInt();
      int[] array = new int[size]; // Input the elements of the array
      System.out.println("Enter the elements of the array:");
      for (int i = 0; i < size; i++) {
         array[i] = sc.nextInt();}
      System.out.println("Alternate numbers of the array:");
      for (int i = 0; i < size; i += 2) {
         System.out.print(array[i] + " ");}
      sc.close();}}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>javac alternate_number_array.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>java alternate_number_array
Enter the size of the array: 5
Enter the elements of the array:
1
2
3
4
5
Alternate numbers of the array:
1 3 5
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>
```

Question 23 : . Given are two one-dimensional arrays A & B, which are sorted in ascending order. Write a Java program to merge them into single sorted array C that contains every item from arrays A & B, in ascending order.

Source Code :

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

```
public class merge_two_array_sort {
   public static void main(String[] args) {
      Scanner scanner = new Scanner(System.in);
      System.out.print("Enter the size of the first array (A): ");
      int sizeA = scanner.nextInt();
      int[] A = new int[sizeA];
      System.out.println("Enter the elements of the first array (A) in ascending order:");
      for (int i = 0; i < sizeA; i++) {
         A[i] = scanner.nextInt();   }
      System.out.print("Enter the size of the second array (B): ");
      int sizeB = scanner.nextInt();
      int[] B = new int[sizeB];
      System.out.println("Enter the elements of the second array (B) in ascending order:");
      for (int i = 0; i < sizeB; i++) {
         B[i] = scanner.nextInt();   }
      int[] C = mergeArrays(A, B);
      System.out.println("Merged array (C):"); // Display the merged array
      for (int num : C) {
         System.out.print(num + " ");
      }scanner.close();}
   public static int[] mergeArrays(int[] A, int[] B) {
      int sizeA = A.length;
      int sizeB = B.length;
      int[] C = new int[sizeA + sizeB];
      int i = 0, j = 0, k = 0;
      while (i < sizeA && j < sizeB) {
         if (A[i] < B[j]) {
            C[k++] = A[i++];
         } else {
            C[k++] = B[j++];}}
      while (i < sizeA) {
         C[k++] = A[i++];}
      while (j < sizeB) {
         C[k++] = B[j++];}
      return C;
   }}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>javac merge_two_array_sort.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>java merge_two_array_sort
Enter the size of the first array (A): 5
Enter the elements of the first array (A) in ascending order:
1
2
3
4
5
Enter the size of the second array (B): 6
Enter the elements of the second array (B) in ascending order:
7
8
9
10
11
12
Merged array (C):
1 2 3 4 5 7 8 9 10 11 12
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>
```

Question 24 : . Write a Java program to show 0-arguments constructor.

Source Code :

```
class MyClass {
   public MyClass() {
      System.out.println("This is a 0-argument constructor.");}
   public void display() {
      System.out.println("hi, how are you?"); }}
public class zero_argument {
   public static void main(String[] args) {
```

```
    MyClass obj = new MyClass();// Creating an object of MyClass
    obj.display(); // Calling a method of the object
 }}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>javac zero_argument.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>java zero_argument
This is a 0-argument constructor.
hi, how are you?
```

Question 25 : . Write a Java program to show parameterized constructor.

Source Code :

```
class Student {
   private String name;
   private int age;
   public Student(String name, int age) { // Parameterized constructor
      this.name = name;
      this.age = age;}
   public void displayDetails() {     // Method to display student details
      System.out.println("Name: " + name);
      System.out.println("Age: " + age);
   }}
public class parameterized_constructor{
   public static void main(String[] args) {
      Student stu1 = new Student("Sahin", 22);
      System.out.println("Student 1 Details:");
      stu1.displayDetails();
      Student stu2 = new Student("Piklu", 18);
      System.out.println("\nStudent 2 Details:");
      stu2.displayDetails();}}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>javac parameterized_constructor.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>java parameterized_constructor
Student 1 Details:
Name: Sahin
Age: 22

Student 2 Details:
Name: Piklu
Age: 18
```

Question 26 : Write a Java program to show constructor overloading.

Source Code :

```
class Box {
   double width;
   double height;
   double depth;
   Box() { // Constructor with no parameters
      width = 1;
      height = 1;
      depth = 1;}
   Box(double w, double h, double d) { // Constructor with three parameters
      width = w;
      height = h;
      depth = d;}
   Box(double len) { // Constructor with a single parameter to create a cube
      width = len;
      height = len;
      depth = len;}
   double volume() { // Method to calculate and return the volume of the box
      return width * height * depth;}}
```

```
public class constructor_overloading{
   public static void main(String[] args) {
      Box box1 = new Box(); // Default constructor
      Box box2 = new Box(5, 3, 4); // Constructor with three parameters
      Box box3 = new Box(2.5); // Constructor with a single parameter
      System.out.println("Volume of box1: " + box1.volume());
      System.out.println("Volume of box2: " + box2.volume());
      System.out.println("Volume of box3: " + box3.volume());
   }}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>javac constructor_overloading.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>java constructor_overloading
Volume of box1: 1.0
Volume of box2: 60.0
Volume of box3: 15.625
```

Question 27 : . Write a class, Grader, which has an instance variable, score, an appropriate constructor and appropriate methods. A method, letterGrade() that returns the letter grade as O/E/A/B/C/F. Now write a demo class to test the Grader class by reading a score from the user, using it to create a Grader object after validating that the value is not negative and is not greater then 100. Finally, call the letterGrade() method to get and print the grade.

Source Code :

```
import java.util.Scanner;
class Grader {
   private int score;
   public Grader(int score) { // Constructor
      this.score = score;}
   public String letterGrade() {
      if (score < 0 || score > 100) {
         return "Invalid Score";
      } else if (score >= 90) {
         return "A";
      } else if (score >= 80) {
         return "B";
      } else if (score >= 70) {
         return "C";
      } else if (score >= 60) {
         return "D";
      } else if (score >= 50) {
         return "E";
      } else {
         return "F"; }}}
public class grader_demo {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      System.out.print("Enter the score: ");
      int score = sc.nextInt();
      if (score < 0 || score > 100) {
         System.out.println("Invalid score. Score must be between 0 and 100.");
      } else {
         Grader ob = new Grader(score);
         System.out.println("Letter Grade: " + ob.letterGrade());
      }sc.close();}}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>javac grader_demo.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>java grader_demo
Enter the score: 87
Letter Grade: B
```

Question 28 : Write a class, Commission, which has an instance variable,sales;an appropriate constructor; and a

method, commission()that returns the commission. Now write a demo class to test the Commission class by reading a sale from the user, using it to create a Commission object after validating that the value is not negative. Finally, call the commission() method to get and print the commission. If the sales are negative, your demo should print the message "Invalid Input".

Source Code :

```
import java.util.Scanner;
class Commission {
   private double sales;
   public Commission(double sales) {
      this.sales = sales;}
   public double commission() { // Method to calculate commission
      if (sales < 0) {
         return -1; // Indicates invalid input
      } else {
         return sales * 0.10; // Assuming commission rate is 10%
      }}}
public class commission_demo {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      System.out.print("Enter the sales amount: ");
      double sales = sc.nextDouble();
      if (sales < 0) { // Validate sales
         System.out.println("Invalid Input");
      } else {
         Commission ob  = new Commission(sales);
         double amount = ob.commission();
         if (amount == -1) {
            System.out.println("Invalid Input");
         } else {
            System.out.println("Commission: Rs " + amount); }}
      sc.close();}}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>javac commission_demo.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week3\week3>java commission_demo
Enter the sales amount: 7.9
Commission: Rs 0.79
```

Week 4

Question 1 : Write a Java program to implement the concept of inheritance.

Source Code :

```
class stu {
  String name;
  public void message() {
    System.out.println("I am student of MCA");
  }}
class Name extends stu { // inherit from stu
  public void display() {   // new method in subclass
    System.out.println("My name is " + name);
  }}
class inheritance_eg {
  public static void main(String[] args) {
    Name ob = new Name();     // create an object of the subclass
    ob.name = "Sahin";
    ob.display();
    // call method of superclass
    // using object of subclass
    ob.message();}}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week4\week4\week4>javac inheritance_eg.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week4\week4\week4>java inheritance_eg
My name is Sahin
I am student of MCA
```

Question 2 : Write a Java program to show method overloading.

Source Code :

```
import java.util.Scanner;
public class method_overloading {
   static int add(int a, int b) {// Method with two integer parameters
      return a + b;          }
   static int add(int a, int b, int c) { // Method with three integer parameters
      return a + b + c;             }
   static double add(double a, double b){ // Method with two double parameters
      return a + b;                 }
   public static void main(String[] args){
      Scanner sc= new Scanner(System.in);
      System.out.println("Enter two integers:");
      int num1 = sc.nextInt();
      int num2 = sc.nextInt();
      System.out.println("Sum of " + num1 + " and " + num2 + " is: " + add(num1, num2));
      System.out.println("Enter three integers:");
      int num3 = sc.nextInt();
      int num4 = sc.nextInt();
      int num5 = sc.nextInt();
      System.out.println("Sum of " + num3 + ", " + num4 + " and " + num5 + " is: " + add(num3, num4, num5));
      System.out.println("Enter two doubles:");
      double num6 = sc.nextDouble();
      double num7 = sc.nextDouble();
      System.out.println("Sum of " + num6 + " and " + num7 + " is: " + add(num6, num7)); }}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week4\week4\week4>javac method_overloading.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week4\week4\week4>java method_overloading
Enter two integers:
23
14
Sum of 23 and 14 is: 37
Enter three integers:
21
32
41
Sum of 21, 32 and 41 is: 94
Enter two doubles:
12.21
34.90
Sum of 12.21 and 34.9 is: 47.11
```

Question 3 : Write a Java program to show method overriding.

Source Code :

```
import java.util.Scanner;
class Animal {
   public void sound() {// Method to make sound
      System.out.println("Animal makes a sound"); }}
class Dog extends Animal { // Child class inheriting from Animal
   public void sound() { // Overriding the makeSound method
      System.out.println("Dog barks"); }}
class Cat extends Animal { // Child class inheriting from Animal
   public void sound() {
      System.out.println("Cat meows"); }}
public class method_overriding {
   public static void main(String[] args) {
      Scanner sc= new Scanner(System.in);
      System.out.println("Enter 'dog' or 'cat' to hear the sound: ");
```

```
        String aype = sc.nextLine();
        Animal ob;// Creating object of Animal class
        if (aype.equalsIgnoreCase("dog")) { // Depending on user input, create an object of Dog or Cat class
            ob= new Dog(); // Dog object created
        } else if (aype.equalsIgnoreCase("cat")) {
            ob= new Cat(); // Cat object created
        } else {
            System.out.println("Invalid input. Please enter 'dog' or 'cat'.");
            return; }
        ob.sound(); // Invoke makeSound method of the respective class
        sc.close();}}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week4\week4\week4>javac method_overriding.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week4\week4\week4>java method_overriding
Enter 'dog' or 'cat' to hear the sound:
dog
Dog barks
```

Question 4 : Write a Java program to show method hiding.

Source Code :

```
class Superclass {
    static void display() {
        System.out.println("Static method in Superclass");}}
class Subclass extends Superclass {
    static void display() {
        System.out.println("Static method in Subclass");}}
public class method_hiding {
    public static void main(String[] args) {
        Superclass.display(); // Call the static method in Superclass
        Subclass.display(); // Call the static method in Subclass
        // Access the static method in Subclass using Superclass reference
        Superclass ref = new Subclass();
        ref.display();}}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week4\week4\week4>javac method_hiding.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week4\week4\week4>java method_hiding
Static method in Superclass
Static method in Subclass
Static method in Superclass
```

Question 5 : Create a general class ThreeDObject and derive the classes Box, Cube, Cylinder and Cone from it. The class ThreeDObject has methods wholeSurfaceArea ( ) and volume ( ). Override these two methods in each of the derived classes to calculate the volume and whole surface area of each type of three-dimensional objects. The dimensions of the objects are to be taken from the users and passed through the respective constructors of each derived class. Write a main method to test these classes.

Source Code :

```
import java.util.Scanner;
class ThreeDObject {
    ThreeDObject() {}     // Default constructor
    double wholeSurfaceArea() { // Method to calculate whole surface area
        return 0.0; }
    double volume() { // Method to calculate volume
        return 0.0;}}
class Box extends ThreeDObject {
    double length, width, height;
    Box(double l, double w, double h) {
        length = l;
        width = w;
        height = h; }
    double wholeSurfaceArea() { // Override method to calculate whole surface area
        return 2 * (length * width + length * height + width * height); }
```

```
    double volume() { // Override method to calculate volume
        return length * width * height; }}
class Cube extends Box {
    Cube(double side) {
        super(side, side, side); }}
class Cylinder extends ThreeDObject {
    double radius, height;
    Cylinder(double r, double h) {
        radius = r;
        height = h;}
    @Override
    double wholeSurfaceArea() { // Override method to calculate whole surface area
        return 2 * Math.PI * radius * (radius + height);}
    double volume() {
        return Math.PI * radius * radius * height;}}
class Cone extends Cylinder {
    Cone(double r, double h) {
        super(r, h);}
    double wholeSurfaceArea() {
        return Math.PI * radius * (radius + Math.sqrt(radius * radius + height * height));}
    double volume() {   // Override method to calculate volume
        return (1.0/3.0) * Math.PI * radius * radius * height;}}
public class three_objects {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.println("Enter length, width, and height of the Box:");
        double boxLength = sc.nextDouble();
        double boxWidth = sc.nextDouble();
        double boxHeight = sc.nextDouble();
        Box b = new Box(boxLength, boxWidth, boxHeight);
        System.out.println("Volume of Box: " + b.volume());
        System.out.println("Whole Surface Area of Box: " + b.wholeSurfaceArea());
        System.out.println("\nEnter side of the Cube:");
        double cubeSide = sc.nextDouble();
        Cube c = new Cube(cubeSide);
        System.out.println("Volume of Cube: " + c.volume());
        System.out.println("Whole Surface Area of Cube: " + c.wholeSurfaceArea());
        System.out.println("\nEnter radius and height of the Cylinder:");
        double cylinderRadius = sc.nextDouble();
        double cylinderHeight = sc.nextDouble();
        Cylinder cy = new Cylinder(cylinderRadius, cylinderHeight);
        System.out.println("Volume of Cylinder: " + cy.volume());
        System.out.println("Whole Surface Area of Cylinder: " + cy.wholeSurfaceArea());
        System.out.println("\nEnter radius and height of the Cone:");
        double coneRadius = sc.nextDouble();
        double coneHeight = sc.nextDouble();
        Cone cone = new Cone(coneRadius, coneHeight);
        System.out.println("Volume of Cone: " + cone.volume());
        System.out.println("Whole Surface Area of Cone: " + cone.wholeSurfaceArea());
        sc.close();
    }}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week4\week4\week4>javac three_objects.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week4\week4\week4>java three_objects
Enter length, width, and height of the Box:
3
8
6
Volume of Box: 144.0
Whole Surface Area of Box: 180.0

Enter side of the Cube:
8
Volume of Cube: 512.0
Whole Surface Area of Cube: 384.0

Enter radius and height of the Cylinder:
2
3
Volume of Cylinder: 37.69911184307752
Whole Surface Area of Cylinder: 62.83185307179586

Enter radius and height of the Cone:
7
8
Volume of Cone: 410.5014400690663
Whole Surface Area of Cone: 387.7071559690282
```

Question 6 : Write a program to create a class named Vehicle having protected instance variables regnNumber, speed, color, ownerName and a method showData ( ) to show "This is a vehicle class". Inherit the Vehicle class into subclasses named Bus and Car having individual private instance variables routeNumber in Bus and manufacturerName in Car and both of them having showData ( ) method showing all details of Bus and Car respectively with content of the super class's showData ( ) method.

Source Code :

```
import java.util.Scanner;
class Vehicle {
   protected String regnNumber;
   protected int speed;
   protected String color;
   protected String ownerName;
   public Vehicle(String regnNumber, int speed, String color, String ownerName) {
      this.regnNumber = regnNumber;
      this.speed = speed;
      this.color = color;
      this.ownerName = ownerName;}
   protected void showData() {
      System.out.println("This is a vehicle class");}}
class Bus extends Vehicle {
   private String routeNumber;
   public Bus(String regnNumber, int speed, String color, String ownerName, String routeNumber) {
      super(regnNumber, speed, color, ownerName);
      this.routeNumber = routeNumber;}
   public void showData() {
      super.showData();
      System.out.println("Registration Number: " + regnNumber);
      System.out.println("Speed: " + speed);
      System.out.println("Color: " + color);
      System.out.println("Owner Name: " + ownerName);
      System.out.println("Route Number: " + routeNumber);}}
class Car extends Vehicle {
   private String manufacturerName;
   public Car(String regnNumber, int speed, String color, String ownerName, String manufacturerName) {
      super(regnNumber, speed, color, ownerName);
      this.manufacturerName = manufacturerName;}
   public void showData() {
      super.showData();
      System.out.println("Registration Number: " + regnNumber);
      System.out.println("Speed: " + speed);
      System.out.println("Color: " + color);
      System.out.println("Owner Name: " + ownerName);
      System.out.println("Manufacturer Name: " + manufacturerName);}}
public class vehicle_bus_car {
```

```
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.println("Enter Bus Details:");
        System.out.print("Registration Number: ");
        String busRegnNumber = sc.nextLine();
        System.out.print("Speed: ");
        int busSpeed = sc.nextInt();
        sc.nextLine(); // Consume newline
        System.out.print("Color: ");
        String busColor = sc.nextLine();
        System.out.print("Owner Name: ");
        String busOwnerName = sc.nextLine();
        System.out.print("Route Number: ");
        String busRouteNumber = sc.nextLine();
        Bus b = new Bus(busRegnNumber, busSpeed, busColor, busOwnerName, busRouteNumber);
        System.out.println("\nBus Details which is entered by the user are:");
        b.showData();
        System.out.println("\nEnter Car Details:");
        System.out.print("Registration Number: ");
        String carRegnNumber = sc.nextLine();
        System.out.print("Speed: ");
        int carSpeed = sc.nextInt();
        sc.nextLine(); // Consume newline
        System.out.print("Color: ");
        String carColor = sc.nextLine();
        System.out.print("Owner Name: ");
        String carOwnerName = sc.nextLine();
        System.out.print("Manufacturer Name: ");
        String carManufacturerName = sc.nextLine();
        Car c = new Car(carRegnNumber, carSpeed, carColor, carOwnerName, carManufacturerName);
        System.out.println("\nCar Details which is entered by the user are:");
        c.showData();
        sc.close();
    }}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week4\week4\week4>javac vehicle_bus_car.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week4\week4\week4>java vehicle_bus_car
Enter Bus Details:
Registration Number: 123
Speed: 40
Color: red
Owner Name: Sahin
Route Number: 30c

Bus Details which is entered by the user are:
This is a vehicle class
Registration Number: 123
Speed: 40
Color: red
Owner Name: Sahin
Route Number: 30c

Enter Car Details:
Registration Number: 234
Speed: 50
Color: lue
Owner Name: Rahim
Manufacturer Name: Tata

Car Details which is entered by the user are:
This is a vehicle class
Registration Number: 234
Speed: 50
Color: lue
Owner Name: Rahim
Manufacturer Name: Tata
```

Question 7 : An educational institution maintains a database of its employees. The database is divided into a number of classes whose hierarchical relationships are shown below. Write all the classes and define the methods to create the database and retrieve individual information as and when needed. Write a driver program to test the classes.

Source Code :

```
import java.util.*;
class Staff { // Base class Staff
    protected int code;
```

```
    protected String name;
    public Staff(int code, String name) {
        this.code = code;
        this.name = name;}
    public void display() {
        System.out.println("Code: " + code);
        System.out.println("Name: " + name);}}
class Teacher extends Staff { // Subclass Teacher
    private String subject;
    private String publication;
    public Teacher(int code, String name, String subject, String publication) {
        super(code, name);
        this.subject = subject;
        this.publication = publication;}
    public void display() {
        super.display();
        System.out.println("Subject: " + subject);
        System.out.println("Publication: " + publication);}}
class Officer extends Staff {// Subclass Officer
    private String grade;
    public Officer(int code, String name, String grade) {
        super(code, name);
        this.grade = grade;}
    public void display() {
        super.display();
        System.out.println("Grade: " + grade);}}
class Typist extends Staff {// Subclass Typist
    private int speed;
    public Typist(int code, String name, int speed) {
        super(code, name);
        this.speed = speed;}
    public void display() {
        super.display();
        System.out.println("Speed: " + speed);}}
class RegularTypist extends Typist {// Subclass RegularTypist
    private double remuneration;
    public RegularTypist(int code, String name, int speed, double remuneration) {
        super(code, name, speed);
        this.remuneration = remuneration;}
    public void display() {
        super.display();
        System.out.println("Remuneration: " + remuneration);}}
class CasualTypist extends Typist {// Subclass CasualTypist
    private double dailyWages;
    public CasualTypist(int code, String name, int speed, double dailyWages) {
        super(code, name, speed);
        this.dailyWages = dailyWages;}
    public void display() {
        super.display();
        System.out.println("Daily Wages: " + dailyWages);}}
public class staff_teacher_officer_typist {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.println("Enter details for Teacher:");
        System.out.print("Code: ");
        int teacherCode = sc.nextInt();
        sc.nextLine(); // Consume newline
        System.out.print("Name: ");
        String teacherName = sc.nextLine();
        System.out.print("Subject: ");
        String subject = sc.nextLine();
        System.out.print("Publication: ");
```

```
String publication = sc.nextLine();
Teacher teacher = new Teacher(teacherCode, teacherName, subject, publication);
System.out.println("\nEnter details for Officer:");
System.out.print("Code: ");
int officerCode = sc.nextInt();
sc.nextLine(); // Consume newline
System.out.print("Name: ");
String officerName = sc.nextLine();
System.out.print("Grade: ");
String grade = sc.nextLine();
Officer officer = new Officer(officerCode, officerName, grade);
System.out.println("\nEnter details for Regular Typist:");
System.out.print("Code: ");
int regularTypistCode = sc.nextInt();
sc.nextLine(); // Consume newline
System.out.print("Name: ");
String regularTypistName = sc.nextLine();
System.out.print("Speed: ");
int speed = sc.nextInt();
System.out.print("Remuneration: ");
double remuneration = sc.nextDouble();
RegularTypist regularTypist = new RegularTypist(regularTypistCode, regularTypistName, speed, remuneration);
System.out.println("\nEnter details for Casual Typist:");
System.out.print("Code: ");
int casualTypistCode = sc.nextInt();
sc.nextLine(); // Consume newline
System.out.print("Name: ");
String casualTypistName = sc.nextLine();
System.out.print("Speed: ");
int casualTypistSpeed = sc.nextInt();
System.out.print("Daily Wages: ");
double dailyWages = sc.nextDouble();
CasualTypist casualTypist = new CasualTypist(casualTypistCode, casualTypistName, casualTypistSpeed, dailyWages);
System.out.println("\nDetails of entered employees:");
System.out.println("\nTeacher:");
teacher.display();
System.out.println("\nOfficer:");
officer.display();
System.out.println("\nRegular Typist:");
regularTypist.display();
System.out.println("\nCasual Typist:");
casualTypist.display();
sc.close();}}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week4\week4\week4>javac staff_teacher_officer_typist.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week4\week4\week4>java staff_teacher_officer_typist
Enter details for Teacher:
Code: 10
Name: Sahin
Subject: Comp Sc
Publication: Chaya Prakashani

Enter details for Officer:
Code: 43
Name: Hrisha
Grade: A

Enter details for Regular Typist:
Code: 99
Name: Ricky
Speed: 45
Remuneration: 987.50

Enter details for Casual Typist:
Code: 34
Name: Ajey
Speed: 60
Daily Wages: 89

Details of entered employees:

Teacher:
Code: 10
Name: Sahin
Subject: Comp Sc
Publication: Chaya Prakashani

Officer:
Code: 43
Name: Hrisha
Grade: A

Regular Typist:
Code: 99
Name: Ricky
Speed: 45
Remuneration: 987.5

Casual Typist:
Code: 34
Name: Ajey
Speed: 60
Daily Wages: 89.0
```

Question 8 : Create a base class Building that stores the number of floors of a building, number of rooms and it's total footage. Create a derived class House that inherits Building and also stores the number of bedrooms and bathrooms. Demonstrate the working of the classes.

Source Code :

```
import java.util.Scanner;

// Base class Building
class Building {
   protected int Floors;
   protected int Rooms;
   protected double Footage;

   public Building(int Floors, int Rooms, double Footage) {
      this.Floors = Floors;
      this.Rooms = Rooms;
      this.Footage = Footage; }
   public void display() {
      System.out.println("Number of Floors: " + Floors);
      System.out.println("Number of Rooms: " + Rooms);
      System.out.println("Total Footage: " + Footage + " sqft"); }}
class House extends Building {
   private int Bedrooms;
   private int Bathrooms;
```

```
    public House(int Floors, int Rooms, double Footage, int Bedrooms, int Bathrooms) {
        super(Floors, Rooms, Footage);
        this.Bedrooms = Bedrooms;
        this.Bathrooms = Bathrooms;}
    public void display() {
        super.display();
        System.out.println("Number of Bedrooms: " + Bedrooms);
        System.out.println("Number of Bathrooms: " + Bathrooms);}}
public class building_house {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.println("Enter details for Building:");
        System.out.print("Number of Floors: ");
        int Floors = sc.nextInt();
        System.out.print("Number of Rooms: ");
        int Rooms = sc.nextInt();
        System.out.print("Total Footage: ");
        double Footage = sc.nextDouble();
        System.out.println("\nEnter details for House:");
        System.out.print("Number of Bedrooms: ");
        int Bedrooms = sc.nextInt();
        System.out.print("Number of Bathrooms: ");
        int Bathrooms = sc.nextInt();
        Building b = new Building(Floors, Rooms, Footage);
        House h= new House(Floors, Rooms, Footage, Bedrooms, Bathrooms);
        System.out.println("\nDetails of Building:");
        b.display();
        System.out.println("\nDetails of House:");
        h.display();
        sc.close();}}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week4\week4\week4>javac building_house.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week4\week4\week4>java building_house
Enter details for Building:
Number of Floors: 3
Number of Rooms: 5
Total Footage: 800

Enter details for House:
Number of Bedrooms: 4
Number of Bathrooms: 4

Details of Building:
Number of Floors: 3
Number of Rooms: 5
Total Footage: 800.0 sqft

Details of House:
Number of Floors: 3
Number of Rooms: 5
Total Footage: 800.0 sqft
Number of Bedrooms: 4
Number of Bathrooms: 4
```

Question 9 : In the earlier program, create a second derived class Office that inherits Building and stores the number of telephones and tables. Now demonstrate the working of all three classes.

Source Code :

```
import java.util.Scanner;
class Building {
    protected int Floors;
    protected int Rooms;
    protected double Footage;
    public Building(int Floors, int Rooms, double Footage) {
        this.Floors = Floors;
        this.Rooms = Rooms;
        this.Footage = Footage;}
```

```
    public void display() {
        System.out.println("Number of Floors: " + Floors);
        System.out.println("Number of Rooms: " + Rooms);
        System.out.println("Total Footage: " + Footage + " sqft");}}
class House extends Building {
    private int Bedrooms;
    private int Bathrooms;
    public House(int Floors, int Rooms, double Footage, int Bedrooms, int Bathrooms) {
        super(Floors, Rooms, Footage);
        this.Bedrooms = Bedrooms;
        this.Bathrooms = Bathrooms;}
    public void display() {
        super.display();
        System.out.println("Number of Bedrooms: " + Bedrooms);
        System.out.println("Number of Bathrooms: " + Bathrooms);}}
class Office extends Building { // Derived class Office
    private int Telephones;
    private int Tables;
    public Office(int Floors, int Rooms, double Footage, int Telephones, int Tables) {
        super(Floors, Rooms, Footage);
        this.Telephones = Telephones;
        this.Tables = Tables;}
    public void display() {
        super.display();
        System.out.println("Number of Telephones: " + Telephones);
        System.out.println("Number of Tables: " + Tables);}}
public class office_building {
    public static void main(String[] args) {
        Scanner sc= new Scanner(System.in);
        System.out.println("Enter details for Building:");
        System.out.print("Number of Floors: ");
        int Floors = sc.nextInt();
        System.out.print("Number of Rooms: ");
        int Rooms = sc.nextInt();
        System.out.print("Total Footage: ");
        double Footage = sc.nextDouble();
        System.out.println("\nEnter details for House:");
        System.out.print("Number of Bedrooms: ");
        int Bedrooms = sc.nextInt();
        System.out.print("Number of Bathrooms: ");
        int Bathrooms = sc.nextInt();
        System.out.println("\nEnter details for Office:");
        System.out.print("Number of Telephones: ");
        int Telephones = sc.nextInt();
        System.out.print("Number of Tables: ");
        int Tables = sc.nextInt();
        Building b = new Building(Floors, Rooms, Footage);
        House h = new House(Floors, Rooms, Footage, Bedrooms, Bathrooms);
        Office o = new Office(Floors, Rooms, Footage, Telephones, Tables);
        System.out.println("\nDetails of Building:");
        b.display();
        System.out.println("\nDetails of House:");
        h.display();
        System.out.println("\nDetails of Office:");
        o.display();
        sc.close();}}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week4\week4\week4>javac office_building.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week4\week4\week4>java office_building
Enter details for Building:
Number of Floors: 4
Number of Rooms: 5
Total Footage: 1000

Enter details for House:
Number of Bedrooms: 4
Number of Bathrooms: 4

Enter details for Office:
Number of Telephones: 15
Number of Tables: 15

Details of Building:
Number of Floors: 4
Number of Rooms: 5
Total Footage: 1000.0 sqft

Details of House:
Number of Floors: 4
Number of Rooms: 5
Total Footage: 1000.0 sqft
Number of Bedrooms: 4
Number of Bathrooms: 4

Details of Office:
Number of Floors: 4
Number of Rooms: 5
Total Footage: 1000.0 sqft
Number of Telephones: 15
Number of Tables: 15
```

Question 10 : Write a Java program which creates a base class Num and contains an integer number along with a method shownum() which displays the number. Now create a derived class HexNum which inherits Num and overrides shownum() which displays the hexadecimal value of the number. Demonstrate the working of the classes.

Source Code :

```
class Superclass {
import java.util.Scanner;
class Num {
   protected int number;
   public Num(int number) {
      this.number = number;}
   public void showNum() {
      System.out.println("Number: " + number); }}
class HexNum extends Num { // Derived class HexNum
   public HexNum(int number) {
      super(number);       }
   public void showNum() {
      System.out.println("Hexadecimal Value: " + Integer.toHexString(number)); }}
public class num_hexnum{
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      System.out.print("Enter an integer number: ");
      int number = sc.nextInt();
      Num num = new Num(number);// Creating objects
      HexNum hexNum = new HexNum(number);
      System.out.println("\nDisplaying number using Num:");
      num.showNum();
      System.out.println("\nDisplaying number using HexNum:");
      hexNum.showNum();
      sc.close(); }}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week4\week4\week4>javac num_hexnum.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week4\week4\week4>java num_hexnum
Enter an integer number: 1230

Displaying number using Num:
Number: 1230

Displaying number using HexNum:
Hexadecimal Value: 4ce
```

Question 11 : Write a Java program which creates a base class Num and contains an integer number along with a method shownum() which displays the number. Now create a derived class OctNum which inherits Num and overrides shownum() which displays the octal value of the number. Demonstrate the working of the classes.

Source Code :

```
import java.util.Scanner;
class Num {
   protected int number;
   public Num(int number) {
      this.number = number;}
   public void showNum() {
      System.out.println("Number: " + number);}}
class OctNum extends Num { // Derived class OctNum
   public OctNum(int number) {
      super(number);       }
   public void showNum() {
      System.out.println("Octal Value: " + Integer.toOctalString(number)); }}
public class num_octnum {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      System.out.print("Enter an integer number: ");
      int number = sc.nextInt();
      Num num = new Num(number);
      OctNum octNum = new OctNum(number);
      System.out.println("\nDisplaying number using Num:");
      num.showNum();
      System.out.println("\nDisplaying number using OctNum:");
      octNum.showNum();
      sc.close();
   }}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week4\week4\week4>javac num_octnum.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week4\week4\week4>java num_octnum
Enter an integer number: 8736

Displaying number using Num:
Number: 8736

Displaying number using OctNum:
Octal Value: 21040
```

Question 12 : Combine Question number 10 and 11 and have all the three classes together. Now describe the working of all classes

Source Code :

```
import java.util.Scanner;
class Num {
   protected int number;
   public Num(int number) {
      this.number = number;}
   public void showNum() {
      System.out.println("Number: " + number); }}
class HexNum extends Num { // Derived class HexNum
   public HexNum(int number) {
      super(number); }
   public void showNum() {
      System.out.println("Hexadecimal Value: " + Integer.toHexString(number)); }}
class OctNum extends Num { // Derived class OctNum
   public OctNum(int number) {
      super(number);}
   public void showNum() {
      System.out.println("Octal Value: " + Integer.toOctalString(number)); }}
public class num_hexnum_octnum {
```

```
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.print("Enter an integer number: ");
        int number = scanner.nextInt();
        Num num = new Num(number);
        HexNum hexNum = new HexNum(number);
        OctNum octNum = new OctNum(number);
        System.out.println("\nDisplaying number using Num:");
        num.showNum();
        System.out.println("\nDisplaying number using HexNum:");
        hexNum.showNum();
        System.out.println("\nDisplaying number using OctNum:");
        octNum.showNum();
        scanner.close();
    }}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week4\week4\week4>javac num_hexnum_octnum.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week4\week4\week4>java num_hexnum_octnum
Enter an integer number: 4565

Displaying number using Num:
Number: 4565

Displaying number using HexNum:
Hexadecimal Value: 11d5

Displaying number using OctNum:
Octal Value: 10725
```

Question 13 : Create a base class Distance which stores the distance between two locations in miles and a method travelTime(). The method prints the time taken to cover the distance when the speed is 60 miles per hour. Now in a derived class DistanceMKS, override travelTime() so that it prints the time assuming the distance is in kilometers and the speed is 100 km per second. Demonstrate the working of the classes

Source Code :

```
import java.util.Scanner;
class Distance {
    protected double distanceInMiles;
    public Distance(double distanceInMiles) {
        this.distanceInMiles = distanceInMiles;}
    public void travelTime() {
        double timeInHours = distanceInMiles / 60.0; // Speed is 60 miles per hour
        System.out.println("Time taken to cover the distance: " + timeInHours + " hours");}}
class DistanceMKS extends Distance { // Derived class DistanceMKS
    public DistanceMKS(double distanceInMiles) {
        super(distanceInMiles);}
    public void travelTime() {
        double distanceInKilometers = distanceInMiles * 1.60934; // Conversion from miles to kilometers
        double timeInSeconds = distanceInKilometers / 100.0; // Speed is 100 kilometers per hour
        System.out.println("Time taken to cover the distance: " + timeInSeconds + " seconds");}}
public class distance_miles {
    public static void main(String[] args) {
        Scanner sc= new Scanner(System.in);
        System.out.print("Enter the distance between two locations in miles: ");
        double distanceInMiles = sc.nextDouble();
        Distance distance = new Distance(distanceInMiles);
        DistanceMKS distanceMKS = new DistanceMKS(distanceInMiles);
        System.out.println("\nTravel time assuming speed is 60 miles per hour:");
        distance.travelTime();
        System.out.println("\nTravel time assuming speed is 100 km per hour:");
        distanceMKS.travelTime();
        sc.close();}}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week4\week4\week4>javac distance_miles.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week4\week4\week4>java distance_miles
Enter the distance between two locations in miles: 780

Travel time assuming speed is 60 miles per hour:
Time taken to cover the distance: 13.0 hours

Travel time assuming speed is 100 km per hour:
Time taken to cover the distance: 12.552852 seconds
```

Question 14 : Create a base class called "vehicle" that stores number of wheels and speed. Create the following derived classes – "car" that inherits "vehicle" and also stores number of passengers. "truck" that inherits "vehicle" and also stores the load limit. Write a main function to create objects of these two derived classes and display all the information about "car" and "truck". Also compare the speed of these two vehicles - car and truck and display which one is faster.

Source Code :

```
import java.util.Scanner;
class Vehicle {
   protected int Wheels;
   protected double speed;
   public Vehicle(int Wheels, double speed) {
      this.Wheels = Wheels;
      this.speed = speed; }
   public double getSpeed() {
      return speed; }
   public void displayInfo() {
      System.out.println("Number of Wheels: " + Wheels);
      System.out.println("Speed: " + speed + " mph"); }}
class Car extends Vehicle { // Derived class Car
   private int Passengers;
   public Car(int Wheels, double speed, int Passengers) {
      super(Wheels, speed);
      this.Passengers = Passengers; }
   public void displayInfo() {
      super.displayInfo();
      System.out.println("Number of Passengers: " + Passengers);}}
class Truck extends Vehicle { // Derived class Truck
   private double loadLimit;
   public Truck(int Wheels, double speed, double loadLimit) {
      super(Wheels, speed);
      this.loadLimit = loadLimit;}
   public void displayInfo() {
      super.displayInfo();
            System.out.println("Load Limit: " + loadLimit + " tons");}}
public class vehicle_car_truck {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      System.out.println("Enter details for Car:");
      System.out.print("Number of Wheels: ");
      int carWheels = sc.nextInt();
      System.out.print("Speed (mph): ");
      double carSpeed = sc.nextDouble();
      System.out.print("Number of Passengers: ");
      int passengers = sc.nextInt();
      System.out.println("\nEnter details for Truck:");
      System.out.print("Number of Wheels: ");
      int truckWheels = sc.nextInt();
      System.out.print("Speed (mph): ");
      double truckSpeed = sc.nextDouble();
      System.out.print("Load Limit (tons): ");
      double loadLimit = sc.nextDouble();
      Car c = new Car(carWheels, carSpeed, passengers);
```

```
        Truck t = new Truck(truckWheels, truckSpeed, loadLimit);
        System.out.println("\nInformation about Car:");
        c.displayInfo();
        System.out.println("\nInformation about Truck:");
        t.displayInfo();
        if (c.getSpeed() > t.getSpeed()) { // Comparing speeds
            System.out.println("\nCar is faster than Truck.");
        } else if (c.getSpeed() < t.getSpeed()) {
            System.out.println("\nTruck is faster than Car.");
        } else {
            System.out.println("\nCar and Truck have the same speed.");}
        sc.close(); }}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week4\week4\week4>javac vehicle_car_truck.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week4\week4\week4>java vehicle_car_truck
Enter details for Car:
Number of Wheels: 4
Speed (mph): 40
Number of Passengers: 50

Enter details for Truck:
Number of Wheels: 8
Speed (mph): 60
Load Limit (tons): 80

Information about Car:
Number of Wheels: 4
Speed: 40.0 mph
Number of Passengers: 50

Information about Truck:
Number of Wheels: 8
Speed: 60.0 mph
Load Limit: 80.0 tons

Truck is faster than Car.
```

Question 15 : Write a Java program to explain "multilevel inheritance."

Source Code :

```
class Animal {
    public void eat() {
        System.out.println("Animal is eating."); }}
class Mammal extends Animal { // Derived class inheriting from Animal
    public void walk() {
        System.out.println("Mammal is walking."); }}
class Dog extends Mammal { // Further derived class inheriting from Mammal
    public void bark() {
        System.out.println("Dog is barking."); }}
public class multilevel_inheritance{
    public static void main(String[] args) {
        Dog dog = new Dog();
        // Calling methods from Animal, Mammal, and Dog classes
        dog.eat();  // Inherited from Animal class
        dog.walk(); // Inherited from Mammal class
        dog.bark(); // Defined in Dog class
                    }}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week4\week4\week4>javac multilevel_inheritance.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week4\week4\week4>java multilevel_inheritance
Animal is eating.
Mammal is walking.
Dog is barking.
```

Week 5

Question 1 : Create a "circle" class & a "point" class. The coordinates of the circle are given and used within the "circle" class as object of the "point" class. Display the area of circle.

Source Code :

```
import java.util.Scanner;
class Point {
   private double x;
   private double y;
   public Point(double x, double y) {
      this.x = x;
      this.y = y;}
   public double getX() {
      return x;}
   public double getY() {
      return y; }}
class Circle {
   private Point center;
   private double radius;
   public Circle(Point center, double radius) {
      this.center = center;
      this.radius = radius;}
   public double getArea() {
      return Math.PI * radius * radius;}}
public class circle_point {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      System.out.println("Enter the x-coordinate of the center:");
      double x = sc.nextDouble();
      System.out.println("Enter the y-coordinate of the center:");
      double y = sc.nextDouble();
      System.out.println("Enter the radius of the circle:");
      double radius = sc.nextDouble();
      Point center = new Point(x, y);
      Circle ob= new Circle(center, radius);
      double area = ob.getArea();
      System.out.println("The area of the circle is: " + area);
      sc.close(); }}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week 5\week5-1\week5>javac circle_point.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week 5\week5-1\week5>java circle_point
Enter the x-coordinate of the center:
3
Enter the y-coordinate of the center:
4
Enter the radius of the circle:
8
The area of the circle is: 201.06192982974676
```

Question 2 : Create a class called Time, which has three private instance variables – hour, min and sec. It contains a method called add( ) which takes one Time object as parameter and print the added value of the calling Time object and passes Time object. In the main method, declare two Time objects and assign values using constructor and call the add() method.

Source Code :

```
import java.util.Scanner;
class Time {
   private int hour;
   private int min;
   private int sec;
   public Time(int hour, int min, int sec) {
      this.hour = hour;
      this.min = min;
```

```
        this.sec = sec;}
    public void add(Time other) {
        this.sec += other.sec;
        this.min += other.min + this.sec / 60;
        this.hour += other.hour + this.min / 60;
        this.sec %= 60;
        this.min %= 60;
        this.hour %= 24;
        System.out.println("Added time: " + this.hour + " hours, " + this.min + " minutes, " + this.sec + " seconds"); }}
public class time_ {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.println("Enter time for first object (hours minutes seconds):");
        int hour1 = sc.nextInt();
        int min1 = sc.nextInt();
        int sec1 = sc.nextInt();
        System.out.println("Enter time for second object (hours minutes seconds):");
        int hour2 = sc.nextInt();
        int min2 = sc.nextInt();
        int sec2 = sc.nextInt();
        Time ob1 = new Time(hour1, min1, sec1);
        Time ob2 = new Time(hour2, min2, sec2);
        System.out.println("Time 1: " + hour1 + " hours, " + min1 + " minutes, " + sec1 + " seconds");
        System.out.println("Time 2: " + hour2 + " hours, " + min2 + " minutes, " + sec2 + " seconds");
        ob1.add(ob2);
        sc.close();}}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week 5\week5-1\week5>javac time_.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week 5\week5-1\week5>java time_
Enter time for first object (hours minutes seconds):
6
24
45
Enter time for second object (hours minutes seconds):
7
34
52
Time 1: 6 hours, 24 minutes, 45 seconds
Time 2: 7 hours, 34 minutes, 52 seconds
Added time: 13 hours, 59 minutes, 37 seconds
```

Question 3 : Create a class called Complex, which has three private instance variables –real and imaginary. It contains a method called add( ) which takes one Complex object as parameter and print the added value of the calling Complex object and passes Complex object. In the main method, declare two Complex objects and assign values using constructor and call the add() method.

Source Code :

```
import java.util.Scanner;
class Complex {
    private double real;
    private double imaginary;
    public Complex(double real, double imaginary) {
        this.real = real;
        this.imaginary = imaginary; }
    public void add(Complex other) {
        double sumReal = this.real + other.real;
        double sumImaginary = this.imaginary + other.imaginary;
        System.out.println("Sum: " + sumReal + " + " + sumImaginary + "i"); }}
public class complex_ {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.println("Enter real and imaginary parts for first complex number:");
        double real1 = sc.nextDouble();
        double imaginary1 = sc.nextDouble();
        System.out.println("Enter real and imaginary parts for second complex number:");
        double real2 = sc.nextDouble();
```

```
        double imaginary2 = sc.nextDouble();
        Complex ob1 = new Complex(real1, imaginary1);
        Complex ob2 = new Complex(real2, imaginary2);
        System.out.println("First Complex Number: " + real1 + " + " + imaginary1 + "i");
        System.out.println("Second Complex Number: " + real2 + " + " + imaginary2 + "i");
        ob1.add(ob2);
        sc.close(); }}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week 5\week5-1\week5>javac complex_.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week 5\week5-1\week5>java complex_
Enter real and imaginary parts for first complex number:
4
5
Enter real and imaginary parts for second complex number:
6
7
First Complex Number: 4.0 + 5.0i
Second Complex Number: 6.0 + 7.0i
Sum: 10.0 + 12.0i
```

Question 4 : Write a program to define a class having one 3-digit number, num as data member. Initialize and display reverse of that number.

Source Code :

```
import java.util.Scanner;
class ThreeDigitNumber {
   private int num;
   public ThreeDigitNumber(int num) {
      if (num < 100 || num > 999) {
         System.out.println("Error: Number must be a 3-digit number.");
         System.exit(1); // Exit the program with an error status
      }
      this.num = num;}
   public void reverseAndDisplay() {
      int originalNum = num;
      int reverse = 0;
      while (originalNum != 0) {
         int digit = originalNum % 10;
         reverse = reverse * 10 + digit;
         originalNum /= 10;}
      System.out.println("Original Number: " + num);
      System.out.println("Reverse of the Number: " + reverse);}}
public class reverse_number{
   public static void main(String[] args) {
      Scanner sc=  new Scanner(System.in);
      System.out.print("Enter a 3-digit number: ");
      int number = sc.nextInt();
      ThreeDigitNumber obj = new ThreeDigitNumber(number);
      obj.reverseAndDisplay();
      sc.close(); }}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week 5\week5-1\week5>javac reverse_number.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week 5\week5-1\week5>java reverse_number
Enter a 3-digit number: 453
Original Number: 453
Reverse of the Number: 354
```

Question 5 : Write a program to define a class Student with four data members such as name, roll no., sub1, and sub2. Define appropriate methods to initialize and display the values of data members. Also calculate total marks and percentage scored by student.

Source Code :

```
import java.util.Scanner;
class Student {
    private String name;
    private int rollNo;
    private int sub1;
    private int sub2;
    public void initialize(String name, int rollNo, int sub1, int sub2) {
        this.name = name;
        this.rollNo = rollNo;
        this.sub1 = sub1;
        this.sub2 = sub2;}
    public void display() {
        System.out.println("Name: " + name);
        System.out.println("Roll No: " + rollNo);
        System.out.println("Marks in Subject 1: " + sub1);
        System.out.println("Marks in Subject 2: " + sub2);}
    public int calculateTotalMarks() {
        return sub1 + sub2;}
    public double calculatePercentage() {
        int totalMarks = calculateTotalMarks();
        return (totalMarks / 2.0); // Considering two subjects, hence dividing by 2.0 for decimal result
    }}
public class student_total_percent {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.println("Enter student details:");
        System.out.print("Name: ");
        String name = sc.nextLine();
        System.out.print("Roll No: ");
        int rollNo = sc.nextInt();
        System.out.print("Marks in Subject 1: ");
        int sub1 = sc.nextInt();
        System.out.print("Marks in Subject 2: ");
        int sub2 = sc.nextInt();
        Student student = new Student();
        student.initialize(name, rollNo, sub1, sub2);
        System.out.println("\nStudent Details:");
        student.display();
        int totalMarks = student.calculateTotalMarks();
        double percentage = student.calculatePercentage();
        System.out.println("\nTotal Marks: " + totalMarks);
        System.out.println("Percentage: " + percentage + "%");
        sc.close(); }}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week 5\week5-1\week5>javac student_total_percent.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week 5\week5-1\week5>java student_total_percent
Enter student details:
Name: Sahin
Roll No: 53
Marks in Subject 1: 87
Marks in Subject 2: 89

Student Details:
Name: Sahin
Roll No: 53
Marks in Subject 1: 87
Marks in Subject 2: 89

Total Marks: 176
Percentage: 88.0%
```

Question 6 : Write a program to define a class Employee to accept emp_id, emp _name, basic_salary from the user and display the gross_salary.

Source Code :

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

```
class Employee {
   private int empId;
   private String empName;
   private double basicSalary;
   public void acceptDetails(int empId, String empName, double basicSalary) {
      this.empId = empId;
      this.empName = empName;
      this.basicSalary = basicSalary; }
   public double calculateGrossSalary() {
      // Assuming 20% of basic salary as allowance
      double allowance = 0.2 * basicSalary;
      double grossSalary = basicSalary + allowance;
      return grossSalary; }
   public void displayGrossSalary() {
      double grossSalary = calculateGrossSalary();
      System.out.println("Employee ID: " + empId);
      System.out.println("Employee Name: " + empName);
      System.out.println("Basic Salary: " + basicSalary);
      System.out.println("Gross Salary: " + grossSalary); }}
public class employee_print{
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      System.out.print("Enter Employee ID: ");
      int empId = sc.nextInt();
      sc.nextLine(); // Consume newline character
      System.out.print("Enter Employee Name: ");
      String empName = sc.nextLine();
      System.out.print("Enter Basic Salary: ");
      double basicSalary = sc.nextDouble();
      Employee ob = new Employee();
      ob.acceptDetails(empId, empName, basicSalary);
      System.out.println("\nEmployee Details and Gross Salary:");
      ob.displayGrossSalary();
            sc.close();}}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week 5\week5-1\week5>javac employee_print.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week 5\week5-1\week5>java employee_print
Enter Employee ID: 98
Enter Employee Name: Sahin
Enter Basic Salary: 9877

Employee Details and Gross Salary:
Employee ID: 98
Employee Name: Sahin
Basic Salary: 9877.0
Gross Salary: 11852.4
```

Question 7 : Write a program to define a class Fraction having data members numerator and denominator. Initialize three objects using different constructors and display its fractional value.

Source Code :

```
class Fraction {
 private int numerator;
 private int denominator;
 public Fraction() {
 numerator = 1;
 denominator = 1;}
 public Fraction(int numerator, int denominator) {
 this.numerator = numerator;
 this.denominator = denominator != 0 ? denominator : 1;}
 public Fraction(int numerator) {
 this.numerator = numerator;
 this.denominator = 1;}
 public void displayFraction() {
```

```
 System.out.println(numerator + "/" + denominator);}}
public class fraction_{
 public static void main(String[] args) {
 Fraction ob1 = new Fraction();
 Fraction ob2 = new Fraction(3, 4);
 Fraction ob3 = new Fraction(5);
 System.out.print("Fraction 1: ");
 ob1.displayFraction();
 System.out.print("Fraction 2: ");
 ob2.displayFraction();
 System.out.print("Fraction 3: ");
 ob3.displayFraction();}}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week 5\week5-1\week5>javac fraction_.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week 5\week5-1\week5>java fraction_
Fraction 1: 1/1
Fraction 2: 3/4
Fraction 3: 5/1
```

Question 8 : Write a program to define a class Item containing code and price. Accept this data for five objects using array of objects. Display code, price in tabular form and also, display total price of all items.

Source Code :

```
import java.util.Scanner;
class Item {
    private String code;
    private double price;
    public Item(String code, double price) {
        this.code = code;
        this.price = price;}
    public String getCode() {
        return code;}
    public double getPrice() {
        return price;}}
public class item_code_price {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        Item[] items = new Item[5]; // Create an array of Item objects to store data for five items
        for (int i = 0; i < items.length; i++) {
            System.out.println("Enter details for Item " + (i + 1) + ":");
            System.out.print("Code: ");
            String code = sc.next();
            System.out.print("Price: ");
            double price = sc.nextDouble();
            items[i] = new Item(code, price);}
        System.out.println("\nCode\tPrice");
        double totalPrice = 0;
        for (Item item : items) {
            System.out.println(item.getCode() + "\t$" + item.getPrice());
            totalPrice += item.getPrice();}
        System.out.println("Total Price: $" + totalPrice);
        sc.close(); }}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week 5\week5-1\week5>javac item_code_price.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week 5\week5-1\week5>java item_code_price
Enter details for Item 1:
Code: 90
Price: 100
Enter details for Item 2:
Code: 91
Price: 200
Enter details for Item 3:
Code: 92
Price: 300
Enter details for Item 4:
Code:
94
Price: 400
Enter details for Item 5:
Code: 95
Price: 500

Code    Price
90      $100.0
91      $200.0
92      $300.0
94      $400.0
95      $500.0
Total Price: $1500.0
```

Question 9 : Write a program to define a class Tender containing data members cost and company name. Accept data for five objects and display company name for which cost is minimum.

Source Code :

```
import java.util.Scanner;
class Tender {
   private double cost;
   private String companyName;
   public Tender(String companyName, double cost) {
      this.companyName = companyName;
      this.cost = cost;}
   public double getCost() {
      return cost;}
   public String getCompanyName() {
      return companyName; }}
public class tender_cost_companyname {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      Tender[] tenders = new Tender[5];
      for (int i = 0; i < tenders.length; i++) {
         System.out.println("Enter details for Tender " + (i + 1) + ":");
         System.out.print("Company Name: ");
         String companyName = sc.nextLine();
         System.out.print("Cost: ");
         double cost = sc.nextDouble();
         tenders[i] = new Tender(companyName, cost);
         sc.nextLine(); } // Consume newline character
      Tender minCostTender = tenders[0];
      for (int i = 1; i < tenders.length; i++) {
         if (tenders[i].getCost() < minCostTender.getCost()) {
            minCostTender = tenders[i];}}
      System.out.println("\nCompany with Minimum Cost:");
      System.out.println("Company Name: " + minCostTender.getCompanyName());
      System.out.println("Cost: " + minCostTender.getCost());
      sc.close();}}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week 5\week5-1\week5>javac tender_cost_companyname.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week 5\week5-1\week5>java tender_cost_companyname
Enter details for Tender 1:
Company Name: Ambani
Cost: 90
Enter details for Tender 2:
Company Name: Ambuja Cement
Cost: 87
Enter details for Tender 3:
Company Name: Adani
Cost: 94
Enter details for Tender 4:
Company Name: Tata
Cost: 89
Enter details for Tender 5:
Company Name: Mahajan
Cost: 81

Company with Minimum Cost:
Company Name: Mahajan
Cost: 81.0
```

Question 10 : Write a program to define a class 'employee' with data members as empid, name and salary. Accept data for 5 objects using Array of objects and print it.

Source Code :

```
import java.util.Scanner;
class Employee {
   private int empId;
   private String name;
   private double salary;
   public Employee(int empId, String name, double salary) {
      this.empId = empId;
      this.name = name;
      this.salary = salary;}
   public void display() {
      System.out.println("Employee ID: " + empId);
      System.out.println("Name: " + name);
      System.out.println("Salary: " + salary);}}
public class employee_print1{
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      Employee[] employees = new Employee[5];
      for (int i = 0; i < employees.length; i++) {
         System.out.println("Enter details for Employee " + (i + 1) + ":");
         System.out.print("Employee ID: ");
         int empId = sc.nextInt();
         sc.nextLine(); // Consume newline character
         System.out.print("Name: ");
         String name = sc.nextLine();
         System.out.print("Salary: ");
         double salary = sc.nextDouble();
         employees[i] = new Employee(empId, name, salary);
         sc.nextLine(); }// Consume newline character
      System.out.println("\nEmployee Details:");
      for (Employee employee : employees) {
         employee.display();
         System.out.println(); }// Add a newline after each employee details
     sc.close(); }}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week 5\week5-1\week5>javac employee_print1.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week 5\week5-1\week5>java employee_print1
Enter details for Employee 1:
Employee ID: 89
Name: Sahin
Salary: 80987
Enter details for Employee 2:
Employee ID: 91
Name: Hrisha
Salary: 90889
Enter details for Employee 3:
Employee ID: 92
Name: Piklu
Salary: 98800
Enter details for Employee 4:
Employee ID: 93
Name: Rohit
Salary: 67678
Enter details for Employee 5:
Employee ID: 94
Name: Lalit
Salary: 78999

Employee Details:
Employee ID: 89
Name: Sahin
Salary: 80987.0

Employee ID: 91
Name: Hrisha
Salary: 90889.0

Employee ID: 92
Name: Piklu
Salary: 98800.0

Employee ID: 93
Name: Rohit
Salary: 67678.0

Employee ID: 94
Name: Lalit
Salary: 78999.0
```

Question 11 : Define a class called circle that contains: • Two private instance variables: radius (of type double) and color (of type String), • Initialize the variables radius and color with default value of 1.0 and "red", respectively using default constructor. • Include a second constructor that will use the default value for color and sets the radius to the value passed as parameter. • Two public methods: getRadius() and getArea() for returning the radius and area of the circle • Invoke the above methods and constructors in the main.

Source Code :

```
public class q11{
        private double radius;
        private String color;
        public q11(){
                this.radius=1.0;
                this.color="red";}
        public q11(double radius){
                this.radius=radius;
                this.color="red";}
        public double getRadius(){
                return this.radius;}
        public double getArea(){
                return 3.14*this.radius*this.radius;}
        public static void main(String[] args){
                q11 c1=new q11();
                q11 c2=new q11(10.4);
                System.out.println("Radius of circle 1 is "+ c1.getRadius());
                System.out.println("Area of circle 1 is "+ c1.getArea());
                System.out.println("Radius of circle 2 is "+ c1.getRadius());
                System.out.println("Area of circle 2 is "+ c1.getArea());}}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week 5\week5-1\week5\week5-1\week5>javac q11.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week 5\week5-1\week5\week5-1\week5>java q11
Radius of circle 1 is 1.0
Area of circle 1 is 3.14
Radius of circle 2 is 1.0
Area of circle 2 is 3.14
```

Question 12 : . Write a program which will accept an integer from the user and pass the value to a method called PrintNumberInWord that will print "ONE", "TWO",... , "NINE", "ZERO" if the integer variable "number" is 1, 2,... , 9, or 0, respectively.

Source Code :

```
import java.util.Scanner;
public class q12{
public static String printNumberWord(int n){
if(n==0){
        return "zero";}
else if(n==1){
return "one";}
else if(n==2){
return "two";}
else if(n==3){
return "three";}
else if(n==4){
return "four";}
else if(n==5){
return "five";}
else if(n==6){
return "six";}
else if(n==7){
return "seven";}
else if(n==8){
return "eight";}
else if(n==9){
return "nine";}
else{
return "Give number between 0 to 9";}}
public static void main(String[] args){
Scanner sc=new Scanner(System.in);
System.out.println("Enter the number");
int n=sc.nextInt();
System.out.println(printNumberWord(n)); }}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week 5\week5-1\week5\week5-1\week5>javac q12.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week 5\week5-1\week5\week5-1\week5>java q12
Enter the number
4
four
```

Question 14 : Write a test program that prompts the user to enter the investment amount (e.g., 1000) and the interest rate (e.g., 9%), and print a table that displays future value for the years from 1 to 30, as shown below: The amount invested: 1000 Annual interest rate: 9% Years Future Value 1 1093.8 2 1196.41 ... 29 13467.25 30 14730.57

Source Code :

```
import java.util.Scanner;
public class Investment{
   public static void main(String[] args) {
      Scanner scanner = new Scanner(System.in);
      System.out.print("Enter the investment amount: ");
      double investmentAmount = scanner.nextDouble();
      System.out.print("Enter the annual interest rate (in percentage): ");
```

```
        double annualInterestRate = scanner.nextDouble();
        annualInterestRate /= 100;
        System.out.println("Years\tFuture Value");
        for (int years = 1; years <= 30; years++) {
            double futureValue = calculateFutureValue(investmentAmount, annualInterestRate, years);
            System.out.printf("%d\t%.2f\n", years, futureValue);}
        scanner.close();}
    private static double calculateFutureValue(double investmentAmount, double annualInterestRate, int years) {
        return investmentAmount * Math.pow(1 + annualInterestRate, years);
    }}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week 5\week5-1\week5\week5-1\week5>javac Investment.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week 5\week5-1\week5\week5-1\week5>java Investment
Enter the investment amount: 600
Enter the annual interest rate (in percentage): 4
Years   Future Value
1       624.00
2       648.96
3       674.92
4       701.92
5       729.99
6       759.19
7       789.56
8       821.14
9       853.99
10      888.15
11      923.67
12      960.62
13      999.04
14      1039.01
15      1080.57
16      1123.79
17      1168.74
18      1215.49
19      1264.11
20      1314.67
21      1367.26
22      1421.95
23      1478.83
24      1537.98
25      1599.50
26      1663.48
27      1730.02
28      1799.22
29      1871.19
30      1946.04
```

Question 15 : Write method headers for the following methods: a. Computing a sales commission, given the sales amount and the commission rate. b. Printing the calendar for a month, given the month and year. c. Computing a square root. d. Testing whether a number is even, and returning true if it is. e. Printing a message a specified number of times. f. Computing the monthly payment, given the loan amount, number of years, and annual interest rate

Source Code :

```
class Methods{
 float commission(float amount, float rate){
 return amount * rate;}
 int squareRoot(int num){
 return num * num;}
 boolean checkEven(int num){
 if(num % 2 == 0)
 return true;
 else
 return false;}
 void display(int n, String msg){
 for(int i=0; i<n; i++){
 System.out.println(msg);}}
 float emi(float p, float r, float t){
 float total = p+(p*r*t);
 return total/(t*12); }}
public class q15 {
 public static void main(String[] args) {
 Methods obj = new Methods();
 System.out.println("Commission: " + obj.commission(1000, 0.05f));
 System.out.println("Square Root: " + obj.squareRoot(5));
```

```
System.out.println(obj.checkEven(97) ? "Number is even" :
"Number is odd");
obj.display(5, "Hello");
System.out.println("EMI: " + obj.emi(10000, 0.05f, 5)); }}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week 5\week5-1\week5\week5-1\week5>javac q15.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week 5\week5-1\week5\week5-1\week5>java q15
Commission: 50.0
Square Root: 25
Number is odd
Hello
Hello
Hello
Hello
Hello
EMI: 208.33333
```

Question 16 : Write a program that reads ten numbers, computes their average, and finds out how many numbers are above the average. [Use this keyword]

Source Code :

```
import java.util.Scanner;
public class Average {
   public static void main(String[] args) {
      Scanner scanner = new Scanner(System.in);
      double[] numbers = new double[10];
      System.out.println("Enter ten numbers:");
      for (int i = 0; i < 10; i++) {
         System.out.print("Number " + (i + 1) + ": ");
         numbers[i] = scanner.nextDouble();}
      double sum = 0;
      for (double num : numbers) {
         sum += num; }
      double average = sum / 10;
      System.out.println("Average: " + average);
      int countAboveAverage = 0;
      for (double num : numbers) {
         if (num > average) {
            countAboveAverage++; }}
      System.out.println("Numbers above average: " + countAboveAverage);
      scanner.close();}}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week 5\week5-1\week5\week5-1\week5>javac Average.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week 5\week5-1\week5\week5-1\week5>java Average
Enter ten numbers:
Number 1: 1
Number 2: 2
Number 3: 3
Number 4: 4
Number 5: 5
Number 6: 6
Number 7: 7
Number 8: 8
Number 9: 9
Number 10: 10
Average: 5.5
Numbers above average: 5
```

Question 17 : Write a program that reads ten integers and displays them in the reverse of the order in which they were read.

Source Code :

```
import java.util.Scanner;
public class ReverseNumbers {
   public static void main(String[] args) {
      Scanner scanner = new Scanner(System.in);
      int[] numbers = new int[10];
      System.out.println("Enter ten integers:");
```

```
    for (int i = 0; i < 10; i++) {
        System.out.print("Enter integer #" + (i + 1) + ": ");
        numbers[i] = scanner.nextInt();}
    System.out.println("\nIntegers in reverse order:");
    for (int i = 9; i >= 0; i--) {
        System.out.println(numbers[i]);}
    scanner.close(); }}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week 5\week5-1\week5\week5-1\week5>javac  ReverseNumbers.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week 5\week5-1\week5\week5-1\week5>java  ReverseNumbers
Enter ten integers:
Enter integer #1: 1
Enter integer #2: 2
Enter integer #3: 3
Enter integer #4: 4
Enter integer #5: 5
Enter integer #6: 6
Enter integer #7: 7
Enter integer #8: 8
Enter integer #9: 9
Enter integer #10: 10

Integers in reverse order:
10
9
8
7
6
5
4
3
2
1
```

Question 18 : Write a program to demonstrate use of 'this' keyword.

Source Code :

```
public class Employee {
    private int empid;
    private String empname;
    private double basic_salary;
    public Employee(int empid, String empname, double basic_salary) {
        this.empid = empid;
        this.empname = empname;
        this.basic_salary = basic_salary;}
    public void displayGrossSalary() {
        double allowances = 0.2 * basic_salary;
        double deductions = 0.1 * basic_salary;
        double gross_salary = basic_salary + allowances - deductions;
        System.out.println("Employee Details:");
        System.out.println("Employee ID: " + empid);
        System.out.println("Employee Name: " + empname);
        System.out.println("Basic Salary: " + basic_salary);
        System.out.println("Allowances: " + allowances);
        System.out.println("Deductions: " + deductions);
        System.out.println("Gross Salary: " + gross_salary);}
    public static void main(String[] args) {
        Employee employee1 = new Employee(1001, "Alice", 50000.0);
        employee1.displayGrossSalary(); }}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week 5\week5-1\week5\week5-1\week5>javac Employee.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week 5\week5-1\week5\week5-1\week5>java Employee
Employee Details:
Employee ID: 1001
Employee Name: Alice
Basic Salary: 50000.0
Allowances: 10000.0
Deductions: 5000.0
Gross Salary: 55000.0
```

Question 19 : Write a program to demonstrate use of 'static' keyword.

Source Code :

```
public class NoOfObjects {
        public static int count=0;
        public NoOfObjects() {
                count++;}
        public static void main(String[] args) {
                NoOfObjects obj1=new NoOfObjects();
                NoOfObjects obj2=new NoOfObjects();
                NoOfObjects obj3=new NoOfObjects();
                System.out.println("we can count no of objects of a class using a static variable and that is "+ count);}}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week 5\week5-1\week5\week5-1\week5>javac NoOfObjects.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week 5\week5-1\week5\week5-1\week5>java NoOfObjects
we can count no of objects of a class using a static variable and that is 3

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week 5\week5-1\week5\week5-1\week5>
```

Question 20 : Write a program to accept value of apple sales for each day of the week (using array of type float) and then, calculate the average sale of the week.

Source Code :

```
import java.util.Scanner;
public class AverageAppleSales {
   public static void main(String[] args) {
      int daysInWeek = 7;
      float[] appleSales = new float[daysInWeek];
      Scanner scanner = new Scanner(System.in);
      for (int day = 0; day < daysInWeek; day++) {
         System.out.print("Enter the sales value for day " + (day + 1) + ": ");
         appleSales[day] = scanner.nextFloat(); }
      float totalSales = 0;
      for (float dailySale : appleSales) {
         totalSales += dailySale; }
      float averageSales = totalSales / daysInWeek;
      System.out.println("The average apple sales for the week is: " + averageSales);}}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week 5\week5-1\week5\week5-1\week5>javac AverageAppleSales.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week 5\week5-1\week5\week5-1\week5>java AverageAppleSales
Enter the sales value for day 1: 43
Enter the sales value for day 2: 42
Enter the sales value for day 3: 65
Enter the sales value for day 4: 32
Enter the sales value for day 5: 76
Enter the sales value for day 6: 53
Enter the sales value for day 7: 42
The average apple sales for the week is: 50.42857
```

Question 21 : Write program, which finds the sum of numbers formed by consecutive digits. Input : 2415 output : 24+41+15=80.

Source Code :

```
import java.util.Scanner;
public class Q21 {
   public static void main(String[] args) {
      Scanner scanner = new Scanner(System.in);
      System.out.print("Enter a number: ");
      int inputNumber = scanner.nextInt();
      int sum = calculateConsecutiveDigitSum(inputNumber);
      System.out.println("Output: " + sum);}
   private static int calculateConsecutiveDigitSum(int number) {
      String strNumber = Integer.toString(number);
      int sum = 0;
      for (int i = 0; i < strNumber.length() - 1; i++) {
```

```
        int currentDigit = Character.getNumericValue(strNumber.charAt(i));
        int nextDigit = Character.getNumericValue(strNumber.charAt(i + 1));
        int consecutiveNumber = currentDigit * 10 + nextDigit;
        sum += consecutiveNumber;}
    return sum; }}
```

Output :

```
C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week 5\week5-1\week5\week5-1\week5>javac Q21.java

C:\Users\nayak\OneDrive\Desktop\mca assingments\sem2\java\code\week 5\week5-1\week5\week5-1\week5>java Q21
Enter a number: 9836
Output: 217
```