Assignment - 5

Object-Oriented Programming in Java

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Problem 1: Sum and Avg of Array Elements

Task: Program to find sum and avg. of array elements

Code:

```java
class _1SumAvg {
    public static void main(String[] args) {
        int[] arr = new int[10];
        for(int i=0; i<arr.length; i++)
            arr[i] = 1 + (int) (Math.random()*100);
        for(int i:arr)
            System.out.print(i + " ");
        // sum
        int sum = 0;
        for(int x:arr)
            sum += x;
        System.out.println();

        // avg
        double avg = (double) sum/arr.length;
        System.out.println("Sum = " + sum);
        System.out.println("Avg = " + avg);
    }
}
```

Output:

```
D:\Do_Not_Open\3_Java\Assignment_Problems\1_Assignments\1_Assignments\5_Assignment>java _1SumAvg.java
94 54 70 98 64 55 42 46 76 68
Sum = 667
Avg = 66.7

D:\Do_Not_Open\3_Java\Assignment_Problems\1_Assignments\1_Assignments\5_Assignment>java _1SumAvg.java
96 37 31 62 43 64 71 79 91 52
Sum = 626
Avg = 62.6
```

Problem 2: Min and Max of array elements

Task: Program to find min and max of array elements

Code: —

```java
class _2MinMax {
    public static void main(String[] args) {
        int[] arr = new int[10];
        for(int i=0; i<arr.length; i++)
            arr[i] = 1 + (int) (Math.random()*100);

        for(int i:arr)
            System.out.print(i + " ");
        System.out.println();

        int min = arr[0];
        int max = arr[0];

        for(int i=0; i<arr.length; i++) {
            if (arr[i] < min)
                min = arr[i];
            if (arr[i] > max)
                max = arr[i];
        }
        System.out.println("Max = "+max+" Min = "+min);
    }
}
```

Output: —

```
D:\Do_Not_Open\3_Java\Assignment_Problems\1_Assignments\1_Assignments\5_Assignment>java _2MinMax.java
7 52 94 21 70 78 96 99 81 20
Max = 99 Min = 7
```

Problem 3: Search Array Element

Task: Program to search an element in array

Code: —

```java
import java.util.Scanner;
class _3Search {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        int[] arr = new int[100];
        for(int i=0; i<arr.length; i++)
            arr[i] = 1 + (int) (Math.random()*100);
        for(int i:arr)
            System.out.print(i + " ");
        System.out.println();
        System.out.print("Enter an element to search: ");
        int x = sc.nextInt();
```

```
13        boolean flag = false;
14
15        for(int i=0; i<arr.length; i++) {
16            if (x == arr[i]){
17                System.out.println("The Item "+x+" is found at "+
                    i);
18                flag = true;
19                break;
20            }
21        }
22
23        if (flag == false)
24            System.out.println("The Item "+x+" is not found in
                the array");
25    }
26 }
```

Output: —

```
D:\Do_Not_Open\3_Java\Assignment_Problems\1_Assignments\1_Assignments\5_Assignment>java _3Search.java
71 50 44 39 44 90 90 47 38 85 49 35 23 100 37 74 16 87 64 74 62 11 29 35 46 64 75 4 64 37 16 79 52 93 60 11 95 87 71 89
58 86 31 64 94 49 52 34 10 2 96 94 86 16 51 19 6 34 9 19 20 78 38 8 91 29 88 88 95 53 66 54 43 4 31 9 23 44 1 61 72 67 5
7 91 47 29 99 74 12 62 57 5 23 29 38 59 52 1 19 36
Enter an element to search: 52
The Item 52 is found at 32

D:\Do_Not_Open\3_Java\Assignment_Problems\1_Assignments\1_Assignments\5_Assignment>java _3Search.java
8 19 85 77 36 89 68 47 18 36 54 57 10 46 70 23 31 69 84 78 63 46 30 30 6 80 15 29 82 69 44 6 51 21 59 75 28 41 8 44 41 7
3 80 87 93 30 56 44 100 100 23 93 8 93 85 99 60 64 6 18 2 84 50 42 75 92 13 70 29 78 17 53 43 97 49 61 96 81 15 12 65 99
 38 75 78 14 16 34 55 84 88 36 94 3 33 33 65 2 41 9
Enter an element to search: 143
The Item 143 is not found in the array
```

Problem 4: Reverse Array Element

Task: Program to reverse elements an array

Code: —

```java
1  class _4ReverseArray {
2      public static void main(String[] args) {
3          int[] arr = new int[10];
4
5          for(int i=0; i<arr.length; i++)
6              arr[i] = 1 + (int) (Math.random()*100);
7
8          // original array
9          for(int x:arr)
10             System.out.print(x + " ");
11         System.out.println();
12
13         int[] reversedArr = new int[arr.length];
14
15         for(int i=0; i<arr.length; i++)
16             reversedArr[i] = arr[arr.length - 1 - i];
17
18         // reversed array
19         System.out.println("Reversed Array: ");
```

```
20          for(int x:reversedArr)
21              System.out.print(x+ " ");
22      }
23 }
```

Output: —

```
D:\Do_Not_Open\3_Java\Assignment_Problems\1_Assignments\1_Assignments\5_Assignment>java _4ReverseArray.java
48 65 79 69 31 8 21 84 12 37
Reversed Array:
37 12 84 21 8 31 69 79 65 48
```

Problem 5: Sort Array

Task: Program to find a way to sort an array

Code: —

```
1  import java.util.Arrays;
2  class _5SortArr {
3      public static void main(String[] args) {
4          int[] arr = new int[10];
5
6          for(int i=0; i<arr.length; i++)
7              arr[i] = 1 + (int) (Math.random()*100);
8
9          // original array
10         for(int x:arr)
11             System.out.print(x + " ");
12         System.out.println();
13
14         Arrays.sort(arr);
15
16         for(int i:arr)
17             System.out.print(i + " ");
18     }
19 }
```

Output: —

```
D:\Do_Not_Open\3_Java\Assignment_Problems\1_Assignments\1_Assignments\5_Assignment>
java _5SortArr.java
8 45 56 20 85 26 86 68 47 48
8 20 26 45 47 48 56 68 85 86
```

Problem 6: Sum of squares of odd index values

Task: Program to find sum of squares of odd index values

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Code: ——

```java
class _6SquaresOddValues {
    // Sum of squares of Odd Index Values
    public static void main(String[] args) {
        int[] arr = new int[10];

        for(int i=0; i<arr.length; i++)
            arr[i] = 1 + (int) (Math.random()*100);

        // original array
        for(int x:arr)
            System.out.print(x + " ");
        System.out.println();

        long sum = 0;
        for(int i=1; i<arr.length; i++){
            if (i % 2 !=0){
                sum += arr[i] * arr[i];
            }
        }
        System.out.println("Sum of squares of Odd Index Values: "
            + sum);
    }
}
```

Output: ——

```
D:\Do_Not_Open\3_Java\Assignment_Problems\1_Assignments\1_Assignments\5_Assignment>java _6SquaresOddValues
7 41 88 4 53 12 75 89 83 52
Sum of squares of Odd Index Values: 12466
```

Problem 7: First and Second Half of an Array

Task: Program to find sum of first and second half of an array

Code: ——

```java
class _7FirstSecondHalfSum {
    public static void main(String[] args) {
        int[] arr = new int[10];

        for(int i=0; i<arr.length; i++)
            arr[i] = 1 + (int) (Math.random()*100);

        // original array
        for(int x:arr)
            System.out.print(x + " ");
        System.out.println();

        int first = 0;
        int second = 0;
```

```
16          for(int i=0; i<arr.length; i++){
17              if (i <= (arr.length/2 - 1))
18                  first += arr[i];
19              else
20                  second += arr[i];
21          }
22
23          System.out.println("Sum of first half: " + first);
24          System.out.println("Sum of second half: " + second);
25      }
26 }
```

Output: —

```
D:\Do_Not_Open\3_Java\Assignment_Problems\1_Assignments\1_Assignments\5_Assignment>
java _7FirstSecondHalfSum.java
71 27 17 58 7 54 22 60 29 53
Sum of first half: 180
Sum of second half: 218
```

Problem 8: Nth Largest/ Smallest

Task: Program to find the nth largest / smallest element in the array

Code: —

```
1  import java.util.Arrays;
2  import java.util.Scanner;
3  class _8Nth {
4      public static void main(String[] args) {
5          Scanner sc = new Scanner(System.in);
6          int[] arr = new int[10];
7
8          for(int i=0; i<arr.length; i++)
9              arr[i] = 1 + (int) (Math.random()*100);
10
11         // original array
12         for(int x:arr)
13             System.out.print(x + " ");
14         System.out.println();
15
16         Arrays.sort(arr);
17
18         // sorted array
19         for(int i:arr)
20             System.out.print(i + " ");
21
22         System.out.println();
23
24         System.out.print("Enter to find the nth largest and
               smallest values: ");
25         int n = sc.nextInt();
```

```
26
27          if (n <= 0 || n > arr.length){
28              System.out.println("Out of range");
29              return;
30          }
31
32          int nthsmallest = arr[n-1];
33          int nthlargest = arr[arr.length - n];
34
35          System.out.println(n+"th smallest element is "+
                nthsmallest);
36          System.out.println(n+"th largest element is "+nthlargest)
                ;
37      }
38 }
```

Output: —

```
D:\Do_Not_Open\3_Java\Assignment_Problems\1_Assignments\1_Assignments\5_Assignment
>java _8Nth.java
18 65 15 51 34 54 38 45 41 92
15 18 34 38 41 45 51 54 65 92
Enter to find the nth largest and smallest values: 2
2th smallest element is 18
2th largest element is 65
```

Problem 9: Read and Print Array Elements

Task: Program to read and print array elements

Code: —

```java
import java.util.Scanner;
class _9ReadPrintArray {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);

        // 1. Reading array elements from user input
        System.out.print("Enter the size of the array: ");
        int size = sc.nextInt();

        int[] userArr = new int[size];

        System.out.println("Enter " + size + " Integer Elements:
            ");
        for(int i=0; i<size; i++){
            System.out.print("Element " + (i + 1) + " : ");
            userArr[i] = sc.nextInt();
        }
        System.out.println();
        // 2. printing array elements
        for(int x:userArr)
            System.out.print(x + " ");
```

```
21        }
22  }
```

Output: —

```
V:\CDAC\3_OOP_Java\1_Assignments\5_Assignment>java _9ReadPrintArray.java
Enter the size of the array: 5
Enter 5 Integer Elements:
Element 1 : 7
Element 2 : 3
Element 3 : 8
Element 4 : 6
Element 5 : 6

7 3 8 6 6
```

Problem 10: Matrix Addition

Task: Program to add two matrices

Code: —

```java
class _10MatrixAddition {
    public static void main(String[] args) {
        // Define two matrices
        int[][] matrixA = {
            {1, 2, 3},
            {4, 5, 6},
            {7, 8, 9}
        };

        int[][] matrixB = {
            {9, 8, 7},
            {6, 5, 4},
            {3, 2, 1}
        };

        // Get the dimensions of the matrices
        int rows = matrixA.length;
        int cols = matrixA[0].length;

        // Check if matrices can be added (same dimensions)
        if (rows != matrixB.length || cols != matrixB[0].length)
            {
                System.out.println("Matrices cannot be added.
                    Dimensions mismatch.");
                return;
        }

        // Create a result matrix to store the sum
        int[][] sumMatrix = new int[rows][cols];

        // Perform matrix addition
        for (int i = 0; i < rows; i++) {
```

8

```
31          for (int j = 0; j < cols; j++) {
32              sumMatrix[i][j] = matrixA[i][j] + matrixB[i][j];
33          }
34      }
35
36      for (int i = 0; i < sumMatrix.length; i++) {
37          for (int j = 0; j < sumMatrix[0].length; j++) {
38              System.out.print(sumMatrix[i][j] + " ");
39          }
40          System.out.println();
41      }
42    }
43 }
```

Output: —

```
V:\CDAC\3_OOP_Java\1_Assignments\5_Assignment>java _10MatrixAddition.java
10 10 10
10 10 10
10 10 10
```

Problem 11: Matrix Multiplication

Task: Program to multiply two matrices

Code: —

```
1  class _11MatrixMultiplication {
2      public static void main(String[] args) {
3          int[][] matrix1 = {{1, 2, 3}, {4, 5, 6}};
4          int[][] matrix2 = {{7, 8}, {9, 10}, {11, 12}};
5
6          int r1 = matrix1.length;
7          int c1 = matrix1[0].length;
8          int r2 = matrix2.length;
9          int c2 = matrix2[0].length;
10
11         // check
12         if (c1 != r2) {
13             System.out.println("Matrix Mutliplication not
                   possible");
14             return;
15         }
16
17         int[][] resultMatrix = new int[r1][c2];
18
19         for(int i=0; i<r1; i++){
20             for(int j=0; j<c2; j++){
21                 for(int k=0; k<c1; k++) {
22                     resultMatrix[i][j] += matrix1[i][k] * matrix2
                           [k][j];
```

```
23                    }
24                }
25            }
26            System.out.println("Resultant Matrix: ");
27
28            for (int i = 0; i < r1; i++) {
29                for (int j = 0; j < c2; j++) {
30                    System.out.print(resultMatrix[i][j] + "\t");
31                }
32                System.out.println(); // New line after each row
33            }
34        }
35 }
```

Output: —

```
V:\CDAC\3_OOP_Java\1_Assignments\5_Assignment>java _11MatrixMultiplication.java
Resultant Matrix:
58      64
139     154
```

Problem 12: Sum of diagonal elements

Task: Program to find sum of diagonal elements

Code: —

```
1  class _12MatrixDaignolSum {
2      public static void main(String[] args) {
3          int[][] myMatrix = {
4              {1, 2, 3},
5              {4, 5, 6},
6              {7, 8, 9}
7          };
8
9          System.out.println("The matrix is:");
10         for (int i = 0; i < myMatrix.length; i++) {
11             for (int j = 0; j < myMatrix[i].length; j++) {
12                 System.out.print(myMatrix[i][j] + " ");
13             }
14             System.out.println();
15         }
16
17         int principalDiagonalSum = 0;
18         int secondaryDiagonalSum = 0;
19         int matrixSize = myMatrix.length; // Assuming a square
                matrix
20
21         for (int i = 0; i < matrixSize; i++) {
22             // Sum of principal diagonal elements
23             principalDiagonalSum += myMatrix[i][i];
24
```

```java
25              // Sum of secondary diagonal elements
26              secondaryDiagonalSum += myMatrix[i][matrixSize - 1 -
                    i];
27          }
28
29          System.out.println("Sum of Principal Diagonal elements: "
                    + principalDiagonalSum);
30          System.out.println("Sum of Secondary Diagonal elements: "
                    + secondaryDiagonalSum);
31      }
32      }
```

Output: —

```
V:\CDAC\3_OOP_Java\1_Assignments\5_Assignment>java _12MatrixDaignolSum.java
The matrix is:
1 2 3
4 5 6
7 8 9
Sum of Principal Diagonal elements: 15
Sum of Secondary Diagonal elements: 15
```