OOPJ ASSIGNMENT – 2

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Section – CSE-25

1. Write a Java program to find the second-largest element in an integer array without sorting

```java
import java.util.*;
public static void main(String args[]) {
    System.out.println("Nishant Nahar -- 241551078");
    Scanner scan = new Scanner(System.in);
    System.out.print("Enter size: ");
    int n = scan.nextInt();
    int[] arr = new int[n];
    System.out.println("Enter " + n + " elements:");
    for (int i = 0; i < n; i++) {
        arr[i] = scan.nextInt();
    }
    int large = arr[0];
    int seclarge = arr[0];
    for (int i = 1; i < n; i++) {
        if (arr[i] > large) {
            seclarge = large;
            large = arr[i];
        } else if (arr[i] > seclarge && arr[i] != large) {
            seclarge = arr[i];
        }
    }
    System.out.println("The Second Largest Number is " + seclarge);
    scan.close();
}
```

OUTPUT

```
PS B:\java_lab\assignment_2> java .\assign_1.java
Nishant Nahar -- 241551078
Enter size: 6
Enter 6 elements:
2 4 7 6 1 9
The Second Largest Number is 7
```

2. Write a Java program to remove duplicate elements from an array and print the new array size

```java
import java.util.*;
public static void main(String args[]) {
```

```
    System.out.println("Nishant Nahar -- 241551078");
    Scanner scan = new Scanner(System.in);
    System.out.print("Enter size: ");
    int n = scan.nextInt();
    int[] arr = new int[n];
    System.out.println("Enter " + n + " elements:");
    for (int i = 0; i < n; i++) {
        arr[i] = scan.nextInt();
    }
    int temp[] = new int[n];
    int size = 0;
    for (int i = 0; i < n; i++) {
        int found = 0;
        for (int j = 0; j < size; j++) {
            if (arr[i] == temp[j]) {
                found = 1;
                break;
            }
        }
        if (found == 0) {
            temp[size] = arr[i];
            size++;
        }
    }
    System.out.println("The new array is:");
    for (int j = 0; j < size; j++) {
        System.out.print(temp[j] + " ");
    }
    System.out.println();
    System.out.println("The size of new array is: " + size);
    scan.close();
}
```

OUTPUT

```
PS B:\java_lab\assignment_2> java .\assign_2.java
Nishant Nahar -- 241551078
Enter size: 6
Enter 6 elements:
6 5 5 3 6 1
The new array is:
6 5 3 1
The size of new array is: 4
```

3. Write a Java program to rotate an array by K positions to the right (user inputs K)

```
import java.util.*;
public static void main(String args[]) {
    System.out.println("Nishant Nahar -- 241551078");
```

```
    Scanner scan = new Scanner(System.in);
    System.out.print("Enter size: ");
    int n = scan.nextInt();
    int[] arr = new int[n];
    System.out.println("Enter " + n + " elements:");
    for (int i = 0; i < n; i++) {
        arr[i] = scan.nextInt();
    }
    System.out.print("Enter the position to be rotated from:");
    int k = scan.nextInt();
    int rotate[] = new int[n];
    int val = 0;
    for (int i = n - k; i < n; i++) {
        rotate[val] = arr[i];
        val++;
    }
    for (int i = 0; i < n - k; i++) {
        rotate[val] = arr[i];
        val++;
    }
    System.out.println("The new array after rotating " + k + " position
is:");
    for (int i = 0; i < n; i++) {
        System.out.print(rotate[i] + " ");
    }
    scan.close();
}
```

OUTPUT

```
PS B:\java_lab\assignment_2> java .\assign_3.java
Nishant Nahar -- 241551078
Enter size: 6
Enter 6 elements:
4 6 1 3 9 2
Enter the position to be rotated from:3
The new array after rotating 3 position is:
3 9 2 4 6 1
```

4.Write a Java program to merge two sorted arrays into a new sorted array (without using built-in sort)

```
import java.util.*;
public static void main(String args[]) {
    System.out.println("Nishant Nahar -- 241551078");
    Scanner sc = new Scanner(System.in);
    System.out.print("Enter size: ");
    int n = sc.nextInt();
    int arr1[] = new int[n];
    System.out.println("Enter " + n + " elements:");
    for (int i = 0; i < n; i++) {
```

```java
        arr1[i] = sc.nextInt();
    }
    System.out.print("Enter size: ");
    int m = sc.nextInt();
    int arr2[] = new int[m];
    System.out.println("Enter " + m + " elements:");
    for (int i = 0; i < m; i++) {
        arr2[i] = sc.nextInt();
    }
    int newarr[] = new int[n + m];
    int i = 0, j = 0, k = 0;
    while (i < n && j < m) {
        if (arr1[i] < arr2[j]) {
            newarr[k] = arr1[i];
            k++;
            i++;
        } else {
            newarr[k] = arr2[j];
            k++;
            j++;
        }
    }
    while (i < n) {
        newarr[k] = arr1[i];
        k++;
        i++;
    }
    while (j < m) {
        newarr[k] = arr2[j];
        k++;
        j++;
    }
    System.out.println("The Merged Array is:");
    for (i = 0; i < k; i++) {
        System.out.print(newarr[i] + " ");
    }
    sc.close();
}
```

OUTPUT

```
PS B:\java_lab\assignment_2> java .\assign_4.java
Nishant Nahar -- 241551078
Enter size: 5
Enter 5 elements:
2 4 6 7 9
Enter size: 4
Enter 4 elements:
3 5 7 8
The Merged Array is:
2 3 4 5 6 7 7 8 9
```

5.Write a Java program to count the frequency of each element in an array (using another array/map logic)

```
import java.util.*;
public static void main(String args[]) {
    System.out.println("Nishant Nahar -- 241551078");
    Scanner sc = new Scanner(System.in);
    System.out.print("Enter size: ");
    int n = sc.nextInt();
    int[] arr = new int[n];
    int[] visited = new int[n];
    System.out.println("Enter " + n + " elements:");
    for (int i = 0; i < n; i++) {
        arr[i] = sc.nextInt();
        visited[i] = 0;
    }
    for (int i = 0; i < n; i++) {
        if (visited[i] == 1) {
            continue;
        }
        int count = 1;
        for (int j = i + 1; j < n; j++) {
            if (arr[i] == arr[j]) {
                count++;
                visited[j] = 1;
            }
        }
        System.out.println("The frequency of " + arr[i] + " is " +
count);
    }
    sc.close();
}
```

OUTPUT

```
PS B:\java_lab\assignment_2> java .\assign_5.java
Nishant Nahar -- 241551078
Enter size: 6
Enter 6 elements:
2 3 2 3 2 3
The frequency of 2 is 3
The frequency of 3 is 3
```

6.Write a Java program to find all pairs of elements whose sum equals a target avoid duplicates

```
import java.util.*;
public static void main(String args[]) {
    System.out.println("Nishant Nahar -- 241551078");
    Scanner sc = new Scanner(System.in);
```

```
    System.out.print("Enter size: ");
    int n = sc.nextInt();
    int[] arr = new int[n];
    int[] visited = new int[n];
    System.out.println("Enter " + n + " elements:");
    for (int i = 0; i < n; i++) {
        arr[i] = sc.nextInt();
        visited[i] = 0;
    }
    System.out.print("Enter the Target Value");
    int tar = sc.nextInt();
    for (int i = 0; i < n; i++) {
        if (visited[i] == 1) {
            continue;
        }
        for (int j = i + 1; j < n; j++) {
            if (visited[j] == 1) {
                continue;
            }
            if (arr[i] + arr[j] == tar) {
                System.out.println("The set is {" + arr[i] + ", " +
arr[j] + "}");
                visited[i] = 1;
                visited[j] = 1;
                break;
            }
        }
    }
    sc.close();
}
```

OUTPUT

```
PS B:\java_lab\assignment_2> java .\assign_6.java
Nishant Nahar -- 241551078
Enter size: 6
Enter 6 elements:
2 4 1 5 7 -1
Enter the Target Value6
The set is {2, 4}
The set is {1, 5}
The set is {7, -1}
```

7. Write a Java program to check whether two arrays are equal (same elements in same order)

```
import java.util.*;
public static void main(String args[]) {
    System.out.println("Nishant Nahar -- 241551078");
    Scanner sc = new Scanner(System.in);
    System.out.print("Enter size: ");
    int n = sc.nextInt();
```

```
    int[] arr1 = new int[n];
    System.out.println("Enter " + n + " elements:");
    for (int i = 0; i < n; i++) {
        arr1[i] = sc.nextInt();
    }
    System.out.print("Enter size: ");
    int m = sc.nextInt();
    int[] arr2 = new int[m];
    System.out.println("Enter " + m + " elements:");
    for (int i = 0; i < m; i++) {
        arr2[i] = sc.nextInt();
    }
    sc.close();
    if (n == m) {
        int i = 0, j = 0;
        while (i < n && j < m) {
            if (arr1[i] != arr2[j]) {
                System.out.println("Arrays are not equal");
                return;
            }
            i++;
            j++;
        }
        System.out.println("Arrays are equal");
    } else {
        System.out.println("Arrays are not equal");
    }
    sc.close();
}
```

OUTPUT

```
PS B:\java_lab\assignment_2> java .\assign_7.java
Nishant Nahar -- 241551078
Enter size: 5
Enter 5 elements:
2 3 1 2 9
Enter size: 4
Enter 4 elements:
2 3 1 2
Arrays are not equal
```

8. Write a Java program to sort an array using Bubble Sort and print each pass.

```
import java.util.*;
public static void main(String args[]) {
    System.out.println("Nishant Nahar -- 241551078");
    Scanner sc = new Scanner(System.in);
    System.out.print("Enter size: ");
```

```
    int n = sc.nextInt();
    int[] arr = new int[n];
    System.out.println("Enter " + n + " elements:");
    for (int i = 0; i < n; i++) {
        arr[i] = sc.nextInt();
    }
    for (int i = 0; i < n - 1; i++) {
        for (int j = 0; j < n - 1 - i; j++) {
            if (arr[j] > arr[j + 1]) {
                int temp = arr[j];
                arr[j] = arr[j + 1];
                arr[j + 1] = temp;
            }
        }
        System.out.print("After pass " + (i + 1) + ": ");
        for (int k = 0; k < n; k++) {
            System.out.print(arr[k] + " ");
        }
        System.out.println();
    }
    System.out.println("Sorted array: ");
    for (int k = 0; k < n; k++) {
        System.out.print(arr[k] + " ");
    }
    sc.close();
}
```

OUTPUT

```
PS B:\java_lab\assignment_2> java .\assign_8.java
Nishant Nahar -- 241551078
Enter size: 5
Enter 5 elements:
9 7 3 2 6
After pass 1: 7 3 2 6 9
After pass 2: 3 2 6 7 9
After pass 3: 2 3 6 7 9
After pass 4: 2 3 6 7 9
Sorted array:
2 3 6 7 9
```

9. Write a Java program to separate even and odd numbers into two different arrays

```
import java.util.*;
public static void main(String args[]) {
    System.out.println("Nishant Nahar -- 241551078");
    Scanner sc = new Scanner(System.in);
    System.out.print("Enter size: ");
    int n = sc.nextInt();
    int[] arr = new int[n];
    System.out.println("Enter " + n + " elements:");
```

```
    for (int i = 0; i < n; i++) {
        arr[i] = sc.nextInt();
    }
    int evenCount = 0, oddCount = 0;
    for (int i = 0; i < n; i++) {
        if (arr[i] % 2 == 0) {
            evenCount++;
        } else {
            oddCount++;
        }
    }
    int[] evenArr = new int[evenCount];
    int[] oddArr = new int[oddCount];
    int eIndex = 0, oIndex = 0;
    for (int i = 0; i < n; i++) {
        if (arr[i] % 2 == 0) {
            evenArr[eIndex++] = arr[i];
        } else {
            oddArr[oIndex++] = arr[i];
        }
    }
    System.out.print("Even numbers: ");
    for (int i = 0; i < evenCount; i++) {
        System.out.print(evenArr[i] + " ");
    }
    System.out.println();
    System.out.print("Odd numbers: ");
    for (int i = 0; i < oddCount; i++) {
        System.out.print(oddArr[i] + " ");
    }
    sc.close();
}
```

OUTPUT

```
PS B:\java_lab\assignment_2> java .\assign_9.java
Nishant Nahar -- 241551078
Enter size: 6
Enter 6 elements:
3 4 6 8 5 1
Even numbers: 4 6 8
Odd numbers: 3 5 1
```

10. Write a Java program to find the longest increasing subsequence (LIS) (basic LIS logic allowed)

```
import java.util.*;
public static void main(String args[]) {
    System.out.println("Nishant Nahar -- 241551078");
    Scanner sc = new Scanner(System.in);
```

```
    System.out.print("Enter size: ");
    int n = sc.nextInt();
    int[] arr = new int[n];
    System.out.println("Enter " + n + " elements:");
    for (int i = 0; i < n; i++) {
        arr[i] = sc.nextInt();
    }
    int count = 1;
    int last = arr[0];
    for (int i = 1; i < n; i++) {
        if (arr[i] > last) {
            count++;
            last = arr[i];
        }
    }
    System.out.println("LIS length: " + count);
    sc.close();
}
```

OUTPUT

```
PS B:\java_lab\assignment_2> java .\assign_10.java
Nishant Nahar -- 241551078
Enter size: 7
Enter 7 elements:
3 4 56 2 34 45 87
LIS length: 4
```

11. Write a Java program to find the maximum sum subarray using Kadane's algorithm.

```
import java.util.*;
public static void main(String args[]) {
    System.out.println("Nishant Nahar -- 241551078");
    Scanner sc = new Scanner(System.in);
    System.out.print("Enter size: ");
    int n = sc.nextInt();
    int[] arr = new int[n];
    System.out.println("Enter " + n + " elements:");
    for (int i = 0; i < n; i++) {
        arr[i] = sc.nextInt();
    }
    int maxSum = arr[0];
    int curr = arr[0];
    for (int i = 1; i < n; i++) {
        if (curr + arr[i] > arr[i]) {
            curr = curr + arr[i];
        } else {
            curr = arr[i];
        }
```

```
        if (curr > maxSum) {
            maxSum = curr;
        }
    }
    System.out.println("Maximum subarray sum: " + maxSum);
    sc.close();
}
```

OUTPUT

```
PS B:\java_lab\assignment_2> java .\assign_11.java
Nishant Nahar -- 241551078
Enter size: 7
Enter 7 elements:
5 -7 12 2 4 8 -1
Maximum subarray sum: 26
```

12. Write a Java program to input a 2D matrix and check whether it is a sparse matrix.

```
import java.util.*;
public static void main(String args[]) {
    System.out.println("Nishant Nahar -- 241551078");
    Scanner sc = new Scanner(System.in);
    System.out.print("Enter rows: ");
    int r = sc.nextInt();
    System.out.print("Enter cols: ");
    int c = sc.nextInt();
    int[][] arr = new int[r][c];
    System.out.println("Enter matrix elements:");
    for (int i = 0; i < r; i++) {
        for (int j = 0; j < c; j++) {
            arr[i][j] = sc.nextInt();
        }
    }
    int zero = 0;
    for (int i = 0; i < r; i++) {
        for (int j = 0; j < c; j++) {
            if (arr[i][j] == 0) {
                zero++;
            }
        }
    }
    int total = r * c;
    if (zero > total / 2) {
        System.out.println("Sparse matrix");
    } else {
        System.out.println("Not a sparse matrix");
    }
```

```
    sc.close();
}
```

OUTPUT

```
PS B:\java_lab\assignment_2> java .\assign_12.java
Nishant Nahar -- 241551078
Enter rows: 5
Enter cols: 5
Enter matrix elements:
0 0 5 0 0
4 5 0 0 0
4 1 8 0 0
0 0 0 0 0
9 0 0 0 0
Sparse matrix
PS B:\java_lab\assignment_2> java .\assign_12.java
Nishant Nahar -- 241551078
Enter rows: 3
Enter cols: 3
Enter matrix elements:
8 7 6
8 7 1
0 0 0
Not a sparse matrix
```

13. Write a Java program to add two 2D matrices of user-given size.

```
import java.util.*;
public static void main(String args[]) {
    System.out.println("Nishant Nahar -- 241551078");
    Scanner sc = new Scanner(System.in);
    System.out.print("Enter rows: ");
    int r = sc.nextInt();
    System.out.print("Enter cols: ");
    int c = sc.nextInt();
    int[][] a = new int[r][c];
    int[][] b = new int[r][c];
    int[][] sum = new int[r][c];
    System.out.println("Enter first matrix:");
    for (int i = 0; i < r; i++) {
        for (int j = 0; j < c; j++) {
            a[i][j] = sc.nextInt();
        }
    }
    System.out.println("Enter second matrix:");
    for (int i = 0; i < r; i++) {
        for (int j = 0; j < c; j++) {
            b[i][j] = sc.nextInt();
        }
    }
    for (int i = 0; i < r; i++) {
```

```
        for (int j = 0; j < c; j++) {
            sum[i][j] = a[i][j] + b[i][j];
        }
    }
    System.out.println("Sum matrix:");
    for (int i = 0; i < r; i++) {
        for (int j = 0; j < c; j++) {
            System.out.print(sum[i][j] + " ");
        }
        System.out.println();
    }
    sc.close();
}
```

OUTPUT

```
PS B:\java_lab\assignment_2> java .\assign_13.java
Nishant Nahar -- 241551078
Enter rows: 3
Enter cols: 3
Enter first matrix:
3 4 7
1 1 2
2 3 4
Enter second matrix:
1 1 1
2 9 7
1 3 8
Sum matrix:
4 5 8
3 10 9
3 6 12
```

14. Write a Java program to multiply two matrices (check dimension validity)

```
import java.util.*;
public static void main(String args[]) {
    System.out.println("Nishant Nahar -- 241551078");
    Scanner sc = new Scanner(System.in);
    System.out.print("Enter rows of A: ");
    int r1 = sc.nextInt();
    System.out.print("Enter cols of A: ");
    int c1 = sc.nextInt();
    System.out.print("Enter rows of B: ");
    int r2 = sc.nextInt();
    System.out.print("Enter cols of B: ");
    int c2 = sc.nextInt();

    boolean valid = (c1 == r2);
    if (!valid) {
        System.out.println("Matrix multiplication not possible");
    } else {
```

```java
        int[][] a = new int[r1][c1];
        int[][] b = new int[r2][c2];
        int[][] mul = new int[r1][c2];

        System.out.println("Enter matrix A:");
        for (int i = 0; i < r1; i++) {
            for (int j = 0; j < c1; j++) {
                a[i][j] = sc.nextInt();
            }
        }
        System.out.println("Enter matrix B:");
        for (int i = 0; i < r2; i++) {
            for (int j = 0; j < c2; j++) {
                b[i][j] = sc.nextInt();
            }
        }
        for (int i = 0; i < r1; i++)
            for (int j = 0; j < c2; j++) {
                int sum = 0;
                for (int k = 0; k < c1; k++) {
                    sum += a[i][k] * b[k][j];
                }
                mul[i][j] = sum;
            }
        System.out.println("Product matrix:");
        for (int i = 0; i < r1; i++) {
            for (int j = 0; j < c2; j++) {
                System.out.print(mul[i][j] + " ");
            }
            System.out.println();
        }
    }
    sc.close();
}
```

OUTPUT

```
PS B:\java_lab\assignment_2> java .\assign_14.java
Nishant Nahar -- 241551078
Enter rows of A: 4
Enter cols of A: 3
Enter rows of B: 3
Enter cols of B: 2
Enter matrix A:
4 3 1 2
2 3 4 5
7 6 5 1
Enter matrix B:
8 9 0
3 4 1
Product matrix:
36 46
28 27
60 58
52 70
```

15. Write a Java program to find the row with the maximum sum in a 2D matrix

```
import java.util.*;
public static void main(String args[]) {
    System.out.println("Nishant Nahar -- 241551078");
    Scanner sc = new Scanner(System.in);
    System.out.print("Enter size of square matrix: ");
    int n = sc.nextInt();
    int[][] arr = new int[n][n];
    System.out.println("Enter matrix elements:");
    for (int i = 0; i < n; i++) {
        for (int j = 0; j < n; j++) {
            arr[i][j] = sc.nextInt();
        }
    }
    boolean symmetric = true;
    for (int i = 0; i < n; i++) {
        for (int j = 0; j < n; j++) {
            if (arr[i][j] != arr[j][i]) {
                symmetric = false;
                break;
            }
        }
        if (!symmetric) {
            break;
        }
    }
    if (symmetric) {
        System.out.println("Matrix is symmetric");
    } else {
        System.out.println("Matrix is not symmetric");
    }
    sc.close();
}
```

OUTPUT

```
PS B:\java_lab\assignment_2> java .\assign_15.java
Nishant Nahar -- 241551078
Enter rows: 4
Enter cols: 4
Enter matrix elements:
8 6 5 2
9 6 2 1
2 0 8 6
9 8 4 2
Row with maximum sum: 3
Maximum sum: 23
```

16. *Write a Java program to check whether a 2D matrix is symmetric*

```java
import java.util.*;
public static void main(String args[]) {
    System.out.println("Nishant Nahar -- 241551078");
    Scanner sc = new Scanner(System.in);
    System.out.print("Enter size of square matrix: ");
    int n = sc.nextInt();
    int[][] arr = new int[n][n];
    System.out.println("Enter matrix elements:");
    for (int i = 0; i < n; i++) {
        for (int j = 0; j < n; j++) {
            arr[i][j] = sc.nextInt();
        }
    }
    boolean symmetric = true;
    for (int i = 0; i < n; i++) {
        for (int j = 0; j < n; j++) {
            if (arr[i][j] != arr[j][i]) {
                symmetric = false;
                break;
            }
        }
        if (!symmetric) {
            break;
        }
    }
    if (symmetric) {
        System.out.println("Matrix is symmetric");
    } else {
        System.out.println("Matrix is not symmetric");
    }
    sc.close();
}
```

OUTPUT

```
PS B:\java_lab\assignment_2> java .\assign_16.java
Nishant Nahar -- 241551078
Enter size of square matrix: 4
Enter matrix elements:
2 3 4 1
1 9 8 7
2 3 4 1
9 9 2 1
Matrix is not symmetric
```

17. Write a Java program to print the boundary elements of a 2D matrix

```java
import java.util.*;
```

```java
public static void main(String args[]) {
    System.out.println("Nishant Nahar -- 241551078");
    Scanner sc = new Scanner(System.in);
    System.out.print("Enter rows: ");
    int r = sc.nextInt();
    System.out.print("Enter cols: ");
    int c = sc.nextInt();
    int[][] arr = new int[r][c];
    System.out.println("Enter matrix elements:");
    for (int i = 0; i < r; i++) {
        for (int j = 0; j < c; j++) {
            arr[i][j] = sc.nextInt();
        }
    }
    System.out.println("Boundary elements:");
    for (int i = 0; i < r; i++) {
        for (int j = 0; j < c; j++) {
            if (i == 0 || i == r - 1 || j == 0 || j == c - 1) {
                System.out.print(arr[i][j] + " ");
            }
        }
    }
    sc.close();
}
```

OUTPUT

```
PS B:\java_lab\assignment_2> java .\assign_17.java
Nishant Nahar -- 241551078
Enter rows: 3
Enter cols: 2
Enter matrix elements:
3 4 7
1 0 8
Boundary elements:
3 4 7 1 0 8
```

18. Write a Java program to find the transpose of a matrix without using an extra array (in-place transpose).

```java
import java.util.*;
public static void main(String args[]) {
    System.out.println("Nishant Nahar -- 241551078");
    Scanner sc = new Scanner(System.in);
    System.out.print("Enter size of square matrix: ");
    int n = sc.nextInt();
    int[][] arr = new int[n][n];
    System.out.println("Enter matrix elements:");
    for (int i = 0; i < n; i++) {
        for (int j = 0; j < n; j++) {
```

```
            arr[i][j] = sc.nextInt();
        }
    }
    for (int i = 0; i < n; i++)
        for (int j = i + 1; j < n; j++) {
            int temp = arr[i][j];
            arr[i][j] = arr[j][i];
            arr[j][i] = temp;
        }
    System.out.println("Transposed matrix:");
    for (int i = 0; i < n; i++) {
        for (int j = 0; j < n; j++) {
            System.out.print(arr[i][j] + " ");
        }
        System.out.println();
    }
    sc.close();
}
```

OUTPUT

```
PS B:\java_lab\assignment_2> java .\assign_18.java
Nishant Nahar -- 241551078
Enter size of square matrix: 3
Enter matrix elements:
6 7 5
7 8 2
1 9 3
Transposed matrix:
6 7 1
7 8 9
5 2 3
```

19. Write a Java program to sort each row of a 2D matrix individually

```
import java.util.*;
public static void main(String args[]) {
    System.out.println("Nishant Nahar -- 241551078");
    Scanner sc = new Scanner(System.in);
    System.out.print("Enter rows: ");
    int r = sc.nextInt();
    System.out.print("Enter cols: ");
    int c = sc.nextInt();
    int[][] arr = new int[r][c];
    System.out.println("Enter matrix elements:");
    for (int i = 0; i < r; i++) {
        for (int j = 0; j < c; j++) {
            arr[i][j] = sc.nextInt();
        }
    }
```

```
    for (int i = 0; i < r; i++) {
        Arrays.sort(arr[i]);
    }
    System.out.println("Matrix after sorting each row:");
    for (int i = 0; i < r; i++) {
        for (int j = 0; j < c; j++) {
            System.out.print(arr[i][j] + " ");
        }
        System.out.println();
    }
    sc.close();
}
```

OUTPUT

```
PS B:\java_lab\assignment_2> java .\assign_19.java
Nishant Nahar -- 241551078
Enter rows: 3
Enter cols: 3
Enter matrix elements:
2 7 6
-1 -3 0
2 5 9
Matrix after sorting each row:
2 6 7
-3 -1 0
2 5 9
```

20. Write a Java program to input an array and shift all zeroes to the end while maintaining order of non-zero elements.

```
import java.util.*;
public static void main(String args[]) {
    System.out.println("Nishant Nahar -- 241551078");
    Scanner sc = new Scanner(System.in);
    System.out.print("Enter size: ");
    int n = sc.nextInt();
    int[] arr = new int[n];
    System.out.println("Enter " + n + " elements:");
    for (int i = 0; i < n; i++) {
        arr[i] = sc.nextInt();
    }
    int index = 0;
    for (int i = 0; i < n; i++) {
        if (arr[i] != 0) {
            arr[index] = arr[i];
            index++;
        }
    }
    for (int i = index; i < n; i++) {
```

```
        arr[i] = 0;
    }
    System.out.println("Array after shifting zeroes:");
    for (int i = 0; i < n; i++) {
        System.out.print(arr[i] + " ");
    }
    sc.close();
}
```

OUTPUT

```
PS B:\java_lab\assignment_2> java .\assign_20.java
Nishant Nahar -- 241551078
Enter size: 8
Enter 8 elements:
-4 -5 4 2 9 0 -9 2
Array after shifting zeroes:
-4 -5 4 2 9 -9 2 0
PS B:\java_lab\assignment_2> java .\assign_20.java
Nishant Nahar -- 241551078
Enter size: 8
Enter 8 elements:
0 8 -8 9 0 3 -4 0
Array after shifting zeroes:
8 -8 9 3 -4 0 0 0
```

21. Create a class Student with data members (name, roll, marks of 3 subjects). Write methods to input details, calculate percentage, and display all details

```
import java.util.*;
class Student {
    String name;
    int roll;
    int marks1, marks2, marks3;
    void inputDetails() {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter name: ");
        name = sc.nextLine();
        System.out.print("Enter roll number: ");
        roll = sc.nextInt();
        System.out.print("Enter marks of 3 subjects(out of 50): ");
        marks1 = sc.nextInt();
        marks2 = sc.nextInt();
        marks3 = sc.nextInt();
        sc.close();
    }
    double calculatePercentage() {
        return (((marks1 + marks2 + marks3) / 150.0) * 100);
    }
    void displayDetails() {
        System.out.println("Name: " + name);
```

```
        System.out.println("Roll Number: " + roll);
        System.out.println("Marks: " + marks1 + " " + marks2 + " "
+ marks3);
        System.out.println("Percentage: " + calculatePercentage());
    }
    public static void main(String args[]) {
        System.out.println("Nishant Nahar -- 241551078");
        Student s = new Student();
        s.inputDetails();
        s.displayDetails();
    }
}
```

OUTPUT

```
PS B:\java_lab\assignment_2> java .\assign_21.java
Nishant Nahar -- 241551078
Enter name: Doyel
Enter roll number: 12
Enter marks of 3 subjects(out of 50): 45 45 46
Name: Doyel
Roll Number: 12
Marks: 45 45 46
Percentage: 90.66666666666666
```

22. Create a class Rectangle with length & breadth. Write methods to compute area, perimeter and display them.

```
import java.util.*;
class Rectangle {
    double length, breadth;
    void inputDimensions() {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter length: ");
        length = sc.nextDouble();
        System.out.print("Enter breadth: ");
        breadth = sc.nextDouble();
        sc.close();
    }
    double area() {
        return length * breadth;
    }
    double perimeter() {
        return 2 * (length + breadth);
    }
    void display() {
        System.out.println("Length: " + length);
        System.out.println("Breadth: " + breadth);
```

```
        System.out.println("Area: " + area());
        System.out.println("Perimeter: " + perimeter());
    }
    public static void main(String args[]) {
        System.out.println("Nishant Nahar -- 241551078");
        Rectangle r = new Rectangle();
        r.inputDimensions();
        r.display();
    }
}
```

OUTPUT

```
PS B:\java_lab\assignment_2> java .\assign_22.java
Nishant Nahar -- 241551078
Enter length: 3
Enter breadth: 8
Length: 3.0
Breadth: 8.0
Area: 24.0
Perimeter: 22.0
```

23. Create a class Account with accountNo, name, balance.Write functions to deposit, withdraw, and display balance

```
import java.util.*;
class Account {
    int accountNo;
    String name;
    double balance;
    void inputDetails() {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter account number: ");
        accountNo = sc.nextInt();
        sc.nextLine();
        System.out.print("Enter name: ");
        name = sc.nextLine();
        System.out.print("Enter initial balance: ");
        balance = sc.nextDouble();
        sc.close();
    }
    void deposit(double amount) {
        balance += amount;
        System.out.println("Amount deposited successfully.");
    }
    void withdraw(double amount) {
        if (amount <= balance) {
            balance -= amount;
```

```
            System.out.println("Amount withdrawn successfully.");
        } else {
            System.out.println("Insufficient balance.");
        }}
    void displayBalance() {
        System.out.println("Account Number: " + accountNo);
        System.out.println("Name: " + name);
        System.out.println("Balance: " + balance);
    }
    public static void main(String args[]) {
        System.out.println("Nishant Nahar -- 241551078");
        Account a = new Account();
        a.inputDetails();
        a.deposit(500);
        a.withdraw(200);
        a.deposit(1000);
        a.withdraw(1);
        a.displayBalance();
    }
}
```

OUTPUT

```
PS B:\java_lab\assignment_2> java .\assign_23.java
Nishant Nahar -- 241551078
Enter account number: 120
Enter name: Nishant
Enter initial balance: 90
Amount deposited successfully.
Amount withdrawn successfully.
Amount deposited successfully.
Amount withdrawn successfully.
Account Number: 120
Name: Nishant
Balance: 1389.0
```

24. Create a class Box with (height, width, depth) and compute volume. Create two objects and compare which box has larger volume.

```
import java.util.*;
class Box {
    double height, width, depth;
    void inputDimensions() {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter height: ");
        height = sc.nextDouble();
        System.out.print("Enter width: ");
        width = sc.nextDouble();
        System.out.print("Enter depth: ");
        depth = sc.nextDouble();
    }
```

```
    double volume() {
        return height * width * depth;
    }
    void display() {
        System.out.println("Height: " + height);
        System.out.println("Width: " + width);
        System.out.println("Depth: " + depth);
        System.out.println("Volume: " + volume());
    }
    public static void main(String args[]) {
        System.out.println("Nishant Nahar -- 241551078");
        Box b1 = new Box();
        Box b2 = new Box();
        System.out.println("Enter dimensions for Box 1:");
        b1.inputDimensions();
        System.out.println("Enter dimensions for Box 2:");
        b2.inputDimensions();
        System.out.println("\nBox 1 details:");
        b1.display();
        System.out.println("\nBox 2 details:");
        b2.display();
        if (b1.volume() > b2.volume()) {
            System.out.println("\nBox 1 has larger volume.");
        } else if (b2.volume() > b1.volume()) {
            System.out.println("\nBox 2 has larger volume.");
        } else {
            System.out.println("\nBoth boxes have equal volume.");
        }
    }
}
```

OUTPUT

```
PS B:\java_lab\assignment_2> java .\assign_24.java
Nishant Nahar -- 241551078
Enter dimensions for Box 1:
Enter height: 3
Enter width: 4
Enter depth: 5
Enter dimensions for Box 2:
Enter height: 3
Enter width: 5
Enter depth: 4

Box 1 details:
Height: 3.0
Width: 4.0
Depth: 5.0
Volume: 60.0

Box 2 details:
Height: 3.0
Width: 5.0
Depth: 4.0
Volume: 60.0

Both boxes have equal volume.
```