Class Worksheet 1

Note – Prefer using STL vectors to solve all the questions. This will get you more familiar with STL syntax.

Write modular code. The main method should call a function that takes in the required parameters as input and if needed returns the output / Or prints it.

Question 1: Sum of Even Indices

Problem Statement: Given a 1D integer array `arr`, write a program to calculate the sum of all elements located at even indices.

Input Format: The first line contains an integer `n`, the size of the array. The second line contains `n` space-separated integers representing the elements of the array.

Example Input:

```
5
1 2 3 4 5
```

Expected Output:

```
9
```

Question 2: Find the Largest Element

Problem Statement: Given a 1D integer array `arr`, find and print the largest element in the array.

Input Format: The first line contains an integer `n`, the size of the array. The second line contains `n` space-separated integers representing the elements of the array.

Example Input:

```
6
15 2 89 4 -1 77
```

Expected Output:

```
89
```

Question 3: Matrix Row Sum

Problem Statement: Given a 2D integer array `matrix` with `R` rows and `C` columns, calculate and print the sum of all elements in each row.

Input Format: The first line contains two space-separated integers, `R` and `C`, the number of rows and columns. The next `R` lines each contain `C` space-separated integers representing the elements of the matrix.

Example Input:

```
3 3
1 2 3
4 5 6
7 8 9
```

Expected Output:

```
6
15
24
```

Question 4: Count Positives

Problem Statement: Given a 1D integer array `arr`, count how many of the elements are positive (greater than 0).

Input Format: The first line contains an integer `n`, the size of the array. The second line contains `n` space-separated integers representing the elements of the array.

Example Input:

```
7
-1 5 0 8 -3 12 1
```

Expected Output:

```
4
```

Question 5: Simple Conditional Check

Problem Statement: Given an integer `x`, print "Even" if `x` is an even number and "Odd" if `x` is an odd number.

Input Format: A single integer `x`.

Example Input:

```
14
```

Expected Output:

```
Even
```

Question 6: Diagonal Sum of a Matrix

Problem Statement: Given a square 2D integer array `matrix` of size `N x N`, find and print the sum of the elements on its main diagonal. The main diagonal consists of elements where the row index is equal to the column index.

Input Format: The first line contains an integer `N`, the size of the matrix. The next `N` lines each contain `N` space-separated integers representing the elements of the matrix.

Example Input:

```
3
1 2 3
4 5 6
7 8 9
```

Expected Output:

```
15
```

Question 7: Reverse a 1D Array

Problem Statement: Given a 1D integer array `arr`, print the elements of the array in reverse order.

Input Format: The first line contains an integer `n`, the size of the array. The second line contains `n` space-separated integers representing the elements of the array.

Example Input:

```
5
1 2 3 4 5
```

Expected Output:

```
5 4 3 2 1
```

Question 8: Count Occurrences

Problem Statement: Given a 1D integer array `arr` and a target integer `t`, count and print the number of times `t` appears in `arr`.

Input Format: The first line contains an integer `n`, the size of the array. The second line contains `n` space-separated integers representing the elements of the array. The third line contains the target integer `t`.

Example Input:

```
7
1 5 2 5 3 5 4
5
```

Expected Output:

```
3
```

Question 9: Check for Palindrome Array

Problem Statement: Given a 1D integer array `arr`, determine if it is a palindrome. An array is a palindrome if it reads the same forwards and backwards. Print "Yes" if it is a palindrome, and "No" otherwise.

Input Format: The first line contains an integer `n`, the size of the array. The second line contains `n` space-separated integers representing the elements of the array.

Example Input:

```
5
1 2 3 2 1
```

Expected Output:

```
Yes
```

Question 10: Find and Replace in a Matrix

Problem Statement: Given a 2D integer array `matrix`, a target integer `t`, and a replacement integer `r`, find all occurrences of `t` in the matrix and replace them with `r`. Then, print the modified matrix.

Input Format: The first line contains two space-separated integers, `R` and `C`, the number of rows and columns. The next `R` lines each contain `C` space-separated integers representing the elements of the matrix. The final line contains two space-separated integers, `t` and `r`.

Example Input:

```
3 4
1 2 3 4
5 6 7 8
9 10 11 12
6 0
```

Expected Output:

```
1 2 3 4
5 0 7 8
9 10 11 12
```

Question 11: Calculate the Average of all Rows

Problem Statement: Write a function called rowAverage that takes a 2D integer array (matrix). The function should calculate and return the average of the elements of all the rows.

Input Format: The first line contains three space-separated integers: R, C, and r. The next R lines contain C space-separated integers representing the matrix.

Example Input:

3 3 1
1 2 3
4 5 6
7 8 9

Expected Output:

2.333
2

5
8

String Problems

Question 1: Count Vowels

Problem Statement: Read a string and count the number of vowels (a, e, i, o, u, case-insensitive). Print the final count.

Input Format: A single line containing a string s.

Example Input:

Hello World

Expected Output:

3

Question 2: Palindrome Check

Problem Statement: Read a string and determine if it is a palindrome. A string is a palindrome if it reads the same forwards and backwards. You can use any method to check. Print "Yes" if it is a palindrome, and "No" otherwise.

Input Format: A single line containing a string s.

Example Input:

madam

Expected Output:

Yes