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DSA Lab 4: Theory.

Q1. Write an algorithm that reverses the element of an array so that the last element become the first, the second to the last becomes the second, and so on.

→ step 1: START
step 2: Define array
step 3: assign values to all the elements of array.
step 4: Define another array of same length
step 5: Iterate the array in reverse order as for (int i=n-1 ; i>=0 ; i--)
step 6: Assign values of arr1 to arr2 such that arr2[n-1-i] = arr1[i]
step 7: Assign iterate for n in straight order such that arr1[i] = arr2[i]
step 8: Print arr1
step 9: Stop.

Q2. 2-D array are basically matrix containing row and column.

→ a) Summation of diagonal of a matrix element lying on primary diagonal is sum of diagonal of matrix

Pseudo code : int sum = 0
for (int i=0 ; i<n ; i++) {
for (int j=0 ; j<n ; j++) {
if (i=j) sum += a[i][j] ;

Ex.

$$\begin{bmatrix} 1 & 2 & 3 \\ & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$$

Sum of diagonal = 1 + 5 + 9 = 15.

b) Transpose matrix.
Transpose of matrix means interchanging the row and column of a matrix
Pseudo code :

```
for (int i=0 ; i<n ; i++){
  for (int j=0 ; j<n ; j++) {
    arr1[j][i] = arr[i][j]
  }
}
```

here arr1, arr is array where arr is predefine.

Ex.

$$\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix} \xrightarrow{\text{Transpose}} \begin{bmatrix} 1 & 4 & 7 \\ 2 & 5 & 8 \\ 3 & 6 & 9 \end{bmatrix}$$

rows and columns are interchanged.

c) Addition, substraction, multiplication of matrix.

Addition of matrix is done by adding some incides of two matrix.

Let a[n][n], b[n][n], c[n][n] be n x n matrix.

Pseudo code:

```
for (int i=0 ; i<n ; i++) {
    for (int j=0 ; j<n ; j++) {
        c[i][j] = a[i][j] + b[i][j]
        cout << c[i][j] << " " ;
    }
}
```

Substraction is similar to addition only instead of c[i][j] = a[i][j] + b[i][j] we have to type c[i][j] = a[i][j] - b[i][j]

Multiplication of matrix are done as multiplication of first matrix row by second matrix column.

eg $\begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix} \times \begin{bmatrix} b_{11} & b_{12} & b_{13} \\ b_{21} & b_{22} & b_{23} \\ b_{31} & b_{32} & b_{33} \end{bmatrix}$

Q3. Ordered list is a list in which the elements are numbered.
In ordered list we can do operations such as ;

① search element.
② add element.
③ remove element.

Ex

a [1, 2, 3, 4, 5, 6] is a ordered list we can search element as by index.
like 4 is an 4th index
'a' can be appended as = [1, 2, 3, 4, 5, 6, 7]
and we can remove element as
~~[1, 2, 3,~~ [1, 3, 4, 5, 6, 7].