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Theory

1)A.
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Step 1 : Start
step 2 : Initialize an array and read elements of
         array.
Step 3 : Initialize two variables start = 0 and
         end = length of array - 1.
step 4 : Repeat following steps until start <= length/2
    4.1 : Swap arr[start] and arr[end]
    4.2 : start = start + 1
    4.3 : end = end + 1
step 5 : stop
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2)A. The two-dimensional array can be defined as an array of arrays. The 2D array is organized as matrices can be represented as collection of rows and columns. It provides ease of the holding of bulk data at once which can be passed to any number of function wherever required.

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a) Summation of diagonal of matrix

For example consider a matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$

To find sum of diagonal of matrix we have to add 1; 5 and 9 = 1+5+9 = 15.
So if we observe at the elements of diagonal the value of row and column becomes equal i.e. at 5 row is 2 and column is 2,
So, whenever row values becomes equal to column value we add the elements and thus we can find sum of diagonal elements of matrix.

b) Transpose of matrix

Let us take a example. $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$

Transpose of matrix A will be

$A' = \begin{bmatrix} 1 & 4 \\ 2 & 5 \\ 3 & 6 \end{bmatrix}$

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So, on observation when we transpose a matrix it's order become reversed. i.e. m x n becomes n x m. so, declare another matrix of order n x m using 2-d arrays. When we transpose the matrix the elements are assigned to place where row and column value are interchanged. So, assign the elements to transpose matrix by interchanging the row and column value i.e. transpose[j][i] = matrix[i][j]

c) Addition, subtract and multiplication of matrix

Take a matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$ and matrix $B = \begin{bmatrix} 2 & 4 & 6 \\ 1 & 3 & 5 \\ 8 & 7 & 10 \end{bmatrix}$

sum of A and B $= \begin{bmatrix} 1+2 & 2+4 & 3+6 \\ 4+1 & 5+3 & 6+5 \\ 7+8 & 8+7 & 9+10 \end{bmatrix} = \begin{bmatrix} 3 & 6 & 9 \\ 5 & 8 & 11 \\ 15 & 15 & 19 \end{bmatrix}$

Subtraction of A and B $= \begin{bmatrix} 1-2 & 2-4 & 3-6 \\ 4-1 & 5-3 & 6-5 \\ 7-8 & 8-7 & 9-10 \end{bmatrix} = \begin{bmatrix} -1 & -2 & -3 \\ 3 & 2 & 1 \\ -1 & 1 & -1 \end{bmatrix}$

So to add or subtract two matrices the order of order of both matrices should be equal (or) equal.

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So, if the order of two matrices is equal, add or subtract corresponding elements of the matrix.

Take a matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$ $B = \begin{bmatrix} 7 & 8 \\ 9 & 10 \\ 11 & 12 \end{bmatrix}$

$$A \times B = \begin{bmatrix} 1\times7+2\times9+3\times11 & 1\times8+2\times10+3\times12 \\ 4\times7+5\times9+6\times11 & 4\times8+5\times10+6\times12 \end{bmatrix} = \begin{bmatrix} 58 & 64 \\ 139 & 154 \end{bmatrix}$$

To perform multiplication of two matrices, the number of columns of first matrix must be equal to number of rows of second matrix. The resultant matrix will have rows of first matrix and columns of second matrix.

So, while multiplying we are taking sum of all products of corresponding elements from row of first matrix and column of second matrix.
So, implementing this we can find product matrix.

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3) A. Consider a list of numbers 17, 26, 31, 54, 77.
Since 17 is smallest item, it occupies the first position in the list and as 77 is biggest one occupies last position.

The structure of ordered list is a colletion of items where each item holds a relative position that is based upon some underlying characteristic of the item. The order is either ascending or descending and we assume list items have a meaning comparison operation that is already defined

Basic operations of ordered list:

- ordered list() creates a new ordered list that is empty. It needs no parameters and return an an empty list.
- add item() adds a new item to the list making sure that the order is preserved.
- remove item() removes the item from the list. It needs the item and modifies the list. Assume the item is present in the list.
- Search(item) searches for the item in the list.
- Size() return number of items in the list