Question 1:
The user will enter the size of a 1D array and fill its data , then the program should convert this 1D to 2D square array – pad with zero if needed – then display the 2D array in matrix form.

Note : 2D array: rows =columns = square root(size 1D array)

Use Functions :

```
int Cal2DArrSize(int size);
void Fill2DArray(int ** arr2D, int arr2DSize, int * arr1D, int arr1DSize);
```

Sample Run:

Enter 1D array size : **5**
Enter array's data : **1 2 3 4 5**

The 2D array is :
1 2 3
4 5 0
0 0 0
Do you wish to continue (y/n)? **y**
Enter 1D array size : **4**
Enter array's data : **1 2 3 4**

The 2D array is :
1 2
3 4
Do you wish to continue (y/n)? **n**

Question 2:

Write a C++ program that reads from the user 2D array of numbers. Then swap the values of the two diagonals of the array.

Hint:

2D Array is square array (number of rows equals to number of columns).

Use dynamic 2D array.

Use the following functions:

```
void Swap_Diagonals(int ** Array2D , int Size)

    void input(int ** Array2D , int Size)
```

Sample of Execution:

Please Enter Size of Array: **4**

Enter Values of Array:

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

Array After Diagonals Swapping:

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

Question 3:
Write a program that asks the user to enter size and dynamic array. Create **another dynamic array** that will be holding Prime numbers only. ***Display MUST be in main***
Use the following functions
bool IsPrime(int num);
void FillPrimeArr(int* OldArr,int Size,int* NewArr, int& NewSize);

Sample Run
Enter how many numbers you will enter: 10
Enter Array: 1 2 3 4 5 6 7 8 9 10
The new array: 2 3 5 7
Do you want to continue (y/n) ? : y
Enter how many numbers you will enter: 10
Enter Array: 11 12 13 14 15 16 17 18 19 20
The new array: 11 13 17 19
Do you want to continue (y/n) ? : n

Question 4:

Write a program that asks the user to enter size and dynamic array. Create **another dynamic array** that will be holding Perfect numbers only. ***Display MUST be in main***

Use the following functions

bool IsPerfect(int num);

void FillPrefectArr(int* OldArr,int Size,int* NewArr, int& NewSize);

Hint: Perfect number, a positive integer that is equal to the sum of its proper divisors. The smallest perfect number is 6, which is the sum of 1, 2, and 3.

Sample Run

Enter how many numbers you will enter: 10

Enter Array: 1 28 30 42 5 6 7 8 91 10

The new array: 28 6

Do you want to continue (y/n) ? : y

Enter how many numbers you will enter: 10

Enter Array: 11 12 13 28 15 16 17 18 19 20

The new array: 28

Do you want to continue (y/n) ? : n

Question 5:
Write a program that reads the size of an array, its elements and then remove all numbers that have duplicates from that array, and displays the resulted array by its new size in main().
Use the following functions:

- **bool isRepeated(int* arr,int size,int num);** // takes number , array and its size returns true if number is repeated more than once in the array.
- **void Removeall(int* arr,int& size,int num)** // take number , array and its size and deletes all occurrences of number in size and update size

Use dynamic arrays only, no global variables.
Sample Run:
Enter the size of the array: 8
Enter the elements: 2 6 8 3 2 3 5 9
After removing duplicates: 6 8 5 9

Question 6:
Write a program that takes the size of an array from the user, reads its elements, then asks the user to enter two numbers (supposed to be found in the array) and finally calculates and displays the sum of the numbers between the two numbers – excluding the two numbers themselves- ***The output MUST be in the main***

You should use functions
void input(int* arr,int size).
int sum(int* arr,int size,int num1, int num2)

Sample Run:
Enter the array size: 7
Enter the array: 3 4 6 1 2 5 9
Enter the first number: 6
Enter the second number: 9
The sum of the numbers between 6 and 9 are 8.

Question 7://Aya rephrase to 2d diagonal sorted

Write a program that takes the size of a dynamic 2-D arrays (size x size) , enter their elements, Then check the values of the two diagonals of the array is it sorted or not. ***Output MUST be in main***

Use the following functions:
void Input(int ** arr,int row,int cols);
bool CheckDiagonals(int** arr,,int row,int cols);

Hint : diagonal is sorted if the diagonal is ordered ascendingly

Sample input
Enter how many numbers you will enter: 3
1 2 3
4 5 6
7 8 9

Sample output
Matrix Diagonals is sorted

Sample input
Enter how many numbers you will enter: 4
1 6 3 7
3 6 4 9
2 2 5 8
8 3 4 5

Sample output
Matrix Diagonals is not sorted

Question 8:
Write a program that reads mxn matrix1, sum each two consecutive columns in a new mxk matrix2 “k = n/2” and display the second matrix. ***Output MUST be in main***
Use the following functions:
void Input(int ** arr,int row,int cols);
void FillSumArr(int** arr,int** newArr,int row,int cols);

Input	**Output**
Enter how many rows : 7 Enter how many columns : 8 Enter Array: 1 2 3 4 5 6 7 8 1 2 3 4 5 6 7 8 1 2 3 4 5 6 7 8 1 2 3 4 5 6 7 8 1 2 3 4 5 6 7 8 1 2 3 4 5 6 7 8 1 2 3 4 5 6 7 8	3 7 11 15 3 7 11 15 3 7 11 15 3 7 11 15 3 7 11 15 3 7 11 15 3 7 11 15